Biological Information for Pacific sardine (*Sardinops sagax*) Captured During Research Cruises, 1992 – 2000

G. A. McFarlane and L. A. MacDougall

Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, British Columbia
V9R 5K6

2001

Canadian Technical Report of Fisheries and Aquatic Sciences 2372

Pêches et Océans Canada
Sciences

Fisheries and Oceans Canada
Science

Canada

Canadian Technical Report of Fisheries and Aquatic Sciences

Technical reports contain scientific and technical information that contributes to existing knowledge but which is not normally appropriate for primary literature. Technical reports are directed primarily toward a worldwide audience and have an international distribution. No restriction is placed on subject matter and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Technical reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

Numbers 1 - 456 in this series were issued as Technical Reports of the Fisheries Research Board of Canada. Numbers 457 - 714 were issued as Department of the Environment, Fisheries and Marine Service Technical Reports. The current series name was changed with report number 925.

Technical reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport technique canadien des sciences halieutiques et aquatiques

Les rapports techniques contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais que ne sont pas normalement appropriés pour la publication dans un journal scientifique. Les rapports techniques sont destinés essentiellement à un public international et ils sont distribués à cet échelon. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, c'est-à-dire les scences halieutiques et aquatiques.

Les rapports techniques peuvent être cités comme des publications complètes. Le titre exact paraît au-dessus du résumé de chaque rapport. Les rapports techniques sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annual des publications scientifiques et techniques du Ministère.

Les numéros 1 à 456 de cette série ont été publiés à titre de rapports techniques de l'Office des recherches sur les pêcheries du Canada. Les numéros 457 à 714 sont parus à titre de rapports techniques de la Direction générale de la recherche et du développement, Service des pêches et de la mer, ministère de l'Environnement. Les numéros 715 à 924 ont été publiés à titre de rapports techniques du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 925.

Les rapports techniques sont produits à l'échelon regional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Technical Report of

Fisheries and Aquatic Sciences 2372

2001

BIOLOGICAL INFORMATION FOR PACIFIC SARDINE (*Sardinops sagax*) CAPTURED DURING RESEARCH CRUISES, 1992 – 2000

by

G. A. McFarlane and L. A. MacDougall

Fisheries and Oceans Canada

Science Branch, Pacific Region

Pacific Biological Station

Nanaimo, British Columbia

V9R 5K6

Her Majesty the Queen in Right of Canada, 2001, as represented
By the Minister of Fisheries and Oceans.

Cat. No. Fs 97-6/2372E ISSN 0706-6457

Correct citation for this publication:

McFarlane, G. A., and L. A. MacDougall. 2001. Cruise details and biological information for cruises capturing Pacific sardine (*Sardinops sagax*), 1992 – 2000. Can. Tech. Rep. Fish. Aquat. Sci. 2372: 149 p.

ABSTRACT

McFarlane, G.,A., and L.,A. MacDougall. 2001. Cruise details and biological information for cruises capturing Pacific sardine (*Sardinops sagax*), 1992 – 2000. Can. Tech. Rep. Fish. Aquat. Sci. 2372: 149 p.

From 1992 to 2000, sardines were captured in a total of 28 cruises, conducted between the months of February and October. Though most often captured in surface trawls, sardines were also present on occasion in bottom trawls, usually captured as the net was retrieved.

Sardines were sampled on – board, and structures or whole sardines were often collected for further analyses in lab, at the Pacific Biological Station. A total of 12944 sardines were sampled during research cruises, and an additional 923 sardines were sampled for length only from commercial fisheries catches in 1998. Sardine lengths ranged from 5 cm to 35 cm (fork length), but the majority of lengths were between 20 cm and 28 cm. Length data in 1998 and 1999 included a greater proportion of smaller (5 cm to 19 cm) sardines than was evident in other sampling years. Age composition as determined from otolith sections ranged from 1 to 8 years old, but the principal age groups for fish aged from 1997 to 1999 were 3 – 5 yr.

RÉSUMÉ

McFarlane, G. A., and L. A. MacDougall. 2001. Cruise details and biological information for cruises capturing Pacific sardine (*Sardinops sagax*), 1992 – 2000. Can. Tech. Rep. Fish. Aquat. Sci. 2372: 149 p.

De 1992 à 2000, des sardines ont été capturées lors d'un total de 28 croisières de recherche effectuées entre février et octobre. Bien que le plus souvent capturées dans des chaluts de surface, des sardines ont aussi été récoltées à l'occasion dans des chaluts de fond, habituellement lorsque l'engin était relevé.

L'échantillonnage des sardines a été fait à bord. Des poissons entiers ou des parties de ceux-ci ont aussi été prélevés aux fins d'analyses ultérieures dans les laboratoires de la Station biologique du Pacifique. Au total, 12 944 sardines ont été échantillonnées pendant les croisières de recherche; 923 autres ont aussi été prélevées dans les prises commerciales de 1998 à la seule fin de détermination de la longueur à la fourche. Celle-ci variait entre 5 et 35 cm, se situait par contre le plus souvent entre 20 et 28 cm. Les données sur la longueur recueillies en 1998 et 1999 incluent un plus grand pourcentage de petites sardines (5 à 19 cm) par rapport aux autres d'années d'échantillonnage. La composition par âge des sardines, telle que déterminée d'après des coupes d'otolithe, allait de 1 à 8 ans, mais les sardines capturées de 1997 à 1999 étaient en grande partie âgées de 3 à 5 ans.

INTRODUCTION

Pacific sardines (*Sardinops sagax*) were the largest fishery in British Columbia from the mid-1920s to the mid-1940s. From 1925 to 1946 catches of sardines ranged from approximately 5 000 t to 80 000 t and averaged approximately 40 000 t annually (Fig. 1). The fishery off British Columbia collapsed in 1947 and sardines completely disappeared from British Columbia waters (McFarlane & Beamish 2001).

On July 1, 1992, Pacific sardines were again captured in fishing operations off the west coast of Vancouver Island after a total absence of over 40 years (Hargreaves, Ware and McFarlane, 1994).

From 1992 to 1995 small numbers of sardines were captured in both commercial and research catches of Pacific hake (*Merluccius productus*). The catches in the hake fishery have continued through 2000, but are not an indication of sardine abundance as hake are fished at depths below the concentrations of sardines (McFarlane & Beamish 1999).

Sardine in spawning condition were sampled off southern Vancouver Island in July 1997, and in February 1998, juvenile sardines were a common component of the fish community in Vancouver Island surface waters (McFarlane & Beamish 2001). These young sardines remained off the coast and were captured throughout British Columbia waters including the Strait of Georgia, northern Hecate Strait and Alaska. Sardines remained abundant and spawned off the west coast of Vancouver Island in 1998.

The objective of this report is to summarize biological data collected during research trawling operations, and bycatch in groundfish fisheries from 1992 to 2000. Research cruises included hake hydroacoustic surveys, juvenile salmonid surveys, and species assemblage studies, along the west coast of Vancouver Island, Queen Charlotte Islands, Dixon Entrance, and the north west coast of Washington.

METHODS

Research cruises were carried out aboard the R/V W.E. Ricker, a 57.3 m (overall length) steel stern trawler equipped with three net drums and two main winches with 1.5" warps. The gear for mid water trawl sets consisted of a model 250/350/14 mid-water rope trawl (Cantrawl Pacific Ltd., Richmond, British Columbia). The front end was 54 m long with large meshes that ranged from less than 2.0 m to more than 3.8 m in width. The intermediate section of the net contained meshes ranging from 1.6 m to 20 cm. The cod end meshes were 10 cm with a 1-cm liner in the last 7.6 m of the cod end. The net was held open with model-P USA Jet Doors. Specified bridle length was 61 m. Chains weighing approximately 200 kg each were attached at each delta plate joining the bridles to the warps. When the doors were at the surface, the headrope was

between the surface and 3.5 m, thus the net fished just below the surface. The net opening (height and width) was measured using a Simrad FS 3300 sounder.

Bottom trawls conducted during the Juvenile Pacific cod survey off the southwest coast of Vancouver Island used a Yankee 36 trawl net, also fished with steel doors. A conventional groundline with16.3 cm rubber discs was used. The headrope contained 24 15.2 cm round plastic floats. The net had 9.0 cm mesh in the wings and body and 2.5 cm mesh in the codend. An FS3200 transducer was attached to the head rope of the net to record net depth, bottom temperature, and fish signals as they entered the net (Hand et al. 1993).

Sardines caught in commercial fishing cruises were captured using commercial fishing gear.

Catches were sorted by species into plastic baskets, either on-deck or once the catch from each trawl had been dumped into a large hopper leading to the fish-handling laboratory below deck. Once sorted, all baskets were weighed to the nearest kilogram using a platform deck balance. Total weight for each species was the sum of individual basket weights for that species. In some cases, individuals were counted to provide a frequency (total numbers of fish captured) for each species.

A sardine catch was either sampled in its entirety, or subsamples of sardines were selected from the total catch by randomly selecting baskets. On board the vessel, sardines were sampled for one or all of the following: fork length (mm), body weight (g), maturity, and sex. Where possible, whole stomachs were preserved in 4% formalin, and paired sagittal otoliths were extracted and stored dry. Stomach contents analysis and age determination were conducted at the Pacific Biological Station (PBS) laboratories at a later date. In some cases, samples of whole sardines were individually quick frozen to be sampled at PBS.

In the laboratory, stomachs were cut open and the contents extracted onto a petrie dish. Volume in cubic centimetres was estimated using a syringe marked every 0.1 cc. The level of digestion of the stomach contents was recorded as a percentage of digestion. Contents were then examined under a dissecting microscope and identified to the lowest taxonomic group possible. Volume (cc) was estimated for each prey item, and the contribution of each prey item to the total contents was expressed as a percent of the total volume. Rather than individual items being counted, each prey item found in a stomach was assigned a percent contribution to the total contents volume of that stomach. As the method of identifying and assigning percent contribution of prey items to overall contents volume was similar to the method described in King and Beamish (2000), the equation used to calculate relative importance of each prey item also follows the modified index provided by King and Beamish (2000):

Relative Importance (RI) = %F.O. x (%C + %V); where

%.F.O. = % frequency of occurrence: the percent of stomachs containing the prey item.

%C = proportion of contents importance: the average percent volume that a prey item contibuted to each stomach individually.
%V = total volume importance: the ratio (as a percent) of the total volume of the prey item divided by the total volume of all prey items combined, for all stomachs combined.

RI relates how much of a prey item an individual eats, how many fish are eating that item, and how much that item contributes to the total volume of food consumed. RI ranges from 0, when the item is not present, to 20 000, when the prey item is the exclusive diet, and can therefore be expressed as a percent (King and Beamish 2000). If a prey item was present in at least two of the three survey years, and obtained an RI greater than 5 (0.03%) in at least one of the survey years, that item formed its own category for graphing and comparison. Prey items not meeting these criteria were grouped together in an "other" category.

Sagittal otoliths collected in 1992 were aged using surface ring patterns. Otoliths collected in 1997, 1998 and 1999 were sliced into thin cross sections, polished, and then examined under a microscope as outlined in Beamish and McFarlane (2000).

RESULTS AND DISCUSSION

During research fishing operations from 1992 to 2000, a total of 28 cruises were conducted in which sardines were captured (Table 1). General cruise summaries and detailed records of the set locations and associated catch are presented in Appendicies 1 through 29. Sardines were captured in cruises during February, March, April, and June to November, though the majority of cruises where sardines were present were conducted between June and August.

A total of 71 other species were also captured in sets where sardines were caught. In addition, species of invertebrates were encountered, including squid, jellyfish, and salps. A list of the common and scientific names of the species caught is presented in Table 2.

A total of 12944 sardines were sampled during research cruises. An additional 923 sardines were sampled during commercial fishing operations in 1998. Data recorded included measurements of length and weight, determination of sex and level of gonad maturity. Otoliths and stomach contents were also analysed. Summaries of lengths, maturities, ages and stomach contents are in tables within Appendicies 1 through 29. A summary of biological data collected from all cruises is presented in Table 3.

Lengths were collected from all (12944) sardines sampled during research cruises from 1992 to 2000, and from 923 sardines sampled during 1998 commercial fishing operations. Lengths were recorded to the nearest millimetre, but are summarized in this report in centimetres. Each cm interval includes 10 mm of length ranges, rounding at 5 mm (e.g. the "24 cm" interval includes data from 235 mm to 244

mm). Length frequency data by set (in mm) are available from the authors. In 1992, 1993, 1997 and 2000, 98% to 100% of all lengths were between 20 and 28 cm. However, data for 1998 and 1999 included higher percentages of smaller sardines than were present in other years (Table 4, Fig. 2). About 22% of the fish collected during 1998 research cruises ranged from 10 to 19 cm, and 6% ranged from 5 to 9 cm. Nearly 7% of fish sampled from commercial fisheries in 1998 ranged from 10 to 19 cm (Table 4). Fish ranging from 10 to 19 cm accounted for approximately 17% of fish recorded during 1999 research cruises.

Multiple length modes are apparent in data collected in 1998 and 1999. From the 1998 research cruise length frequency distribution 3 modes were present (Fig. 2). There was a modal length at 11 cm, 16 cm and 24 cm. The length frequency distribution from sardines sampled during 1998 commercial fishing operations had a similar configuration, with modes at 23 cm, and 11 cm. The length frequency distribution for 1999 had less distinct modes; however, modes can be identified at 24 cm, 19 cm and 16 cm (Fig. 2).

The average length for all data sampled from 1992 to 2000 was 21.6 cm. Annual average lengths were higher than the overall average in 1992 (24.3 cm), 1993 (26.2 cm), 1997 (22.7 cm), and 2000 (24.8 cm). Averages for 1998 (20.3 cm) and 1999 (20.8 cm) were below the overall average, demonstrating the smaller fish present in samples from both these years.

A total of 528 ages were estimated from sardines collected in 1992, 1997, 1998 and 1999. Otoliths collected in 1992 were surface aged, therefore the age data from 1992 may be inconsistent with the age data collected in later years. Ages ranged from 1 to 8 years old (Table 5). Two-year old sardines were a major contributor to 1992 data (nearly 40%). More than 90% of all sardines captured and aged from 1997 to 1999 were between the ages of 3 and 5, with 4 year olds making up the majority of age data in each of these years. In 1997, 4 year old sardines accounted for approximately 55% of the aged sardines. Nearly 45% of all sardines captured and aged in 1998 and 1999 were 4 year olds (Fig. 3). Two-year olds also formed a small part of the age distribution in 1997 and 1998 (1.5% and 3.9% respectively), but were absent from the 1999 data.

Stomach contents were collected in 1997, 1998 and 1999 for analysis of sardine diet. A total of 307 stomachs were analysed. In 1997 and 1998, sardine scales were included in the records of stomach contents. In 1999, the analysis method was modified so that sardine scales were not included as prey items. All prey items, and the total number of stomachs sampled, are presented in Table 6. The summary data provided in Table 6 shows the sardine scale volume for 1997 and 1998 but it is not included in the analysis, in charts or in the contribution by prey type discussion to follow. Likewise, any unidentifiable matter resulting from excessive digestion was included in Table 6 for totality, but was excluded from the analysis. As we were interested in the importance and contribution of various types of prey to the sardine diet, stomachs containing 100% digested matter, sardine scales, or a combination of the two, were removed from the analysis.

In 1997 a total of 140 stomachs were sampled, none of which were empty; however, 109 stomachs contained 100% digested matter or 100% digested matter + sardine scales. Analysis was carried out on the remaining 31 stomachs only. Total volume for the 31 stomachs was 21.2 cc, of which 12.9 cc (61%) was unidentifiable digested matter, and 1.7 cc (8%) was sardine scales. The remaining total volume was 6.5 cc (Table 7). Relative importance (RI) values for all three were influenced mainly by total volume importance (%V), and frequency of occurrence (%F.O.). In all cases, proportion of contents importance (%C) was very low (%C under 15% for all prey items) (Fig. 4). The top three prey items were euphausiids, juvenile crab (zoea and megalops), and eggs (mainly identified as copepod and euphausiid eggs) (Fig. 5).

In 1998, 116 stomachs were analysed, including 11 empty stomachs, and 5 stomachs containing 100% digested matter + sardine scales. Total volume of stomach contents for the remaining 100 stomachs was 48.6 cc, of which 6.0 cc (12%) was digested matter, and 9.9 cc (20%) consisted of sardine scales. The remaining volume was 32.7 cc (Table 7). The top three important prey items were phytoplankton, euphausiid eggs and euphausiids (Fig. 6). Relative importance values for phytoplankton and euphausiid eggs were primarily influenced by %F.O. and %V, yielding RI's of 2413 (12%) and 1398 (7%) respectively (Fig. 7). The relative importance of euphausiids was influenced mainly by %V, giving an RI value of 887 (4%). Calaniods were present in nearly 34% of the stomachs analysed in 1998, but contributed very little to the overall volume of prey, or to the average prey volume by stomach.

In 1999, 51 stomachs were analysed, 2 of which were empty. Total volume of the remaining 49 stomachs was 12.1 cc, digested matter accounting for 2.14 cc (18%), leaving 9.96 cc for the total volume (Table 8). The top three important prey items for 1999 were oikopleura, calanoids and phytoplankton. Frequency of occurrence was a major contributor to the RI for all three (Fig. 7). Values for %C and %V were each about 50% for oikopleura, but %F.O. was over 90%, yielding a relative importance value of 8388.6 (41.9%). The calanoid prey category had far smaller %C and %V values, at 23% and 29% respectively, but %F.O. was over 92%, giving a relative index value of 4794.4 (24%). While phytoplankton made up very little of the contents volume overall, or average contents volume by stomach, frequency of occurrence was nearly 80%, giving an RI of 1050.6 (5.3%) (Fig. 9).

Comparing 1997 and 1998 results to 1999 results suggests changes in prey composition. Oikopleura species, absent from 1997 and 1998 stomachs altogether, were the most important prey item in 1999, found in virtually all stomachs analysed. Likewise, calanoid prey items became far more important contributors to sardine diet in 1999 compared to 1997 and 1998, in terms of the number of fish consuming them, and their relative contribution to diet by volume. Euphausiids had been a very important prey item in 1997 and 1998, but in 1999 euphausiids were found in less than 4% of the stomachs and became one of the least important prey items listed. While phytoplankton and euphausiid eggs were present in a greater percent of

stomachs analysed in 1999 than in 1998, they contributed less to the overall volume or average volume per stomach than they had in1998.

REFERENCES

Beamish, R.J., and G.A. McFarlane. 2000. Reevaluation of the interpretation of annuli from otoliths of a long-lived fish, *Anoplopoma fimbria*. Fish. Res. (in press).

Hand, C.M., B.J. Waddell, D.J. Murie, and G.E. Gillespie. 1993. R/V W.E. Ricker Juvenile Pacific Cod (Gadus macrocephalus) survey off the southwest coast of Vancouver Island, September 21 – October 2, 1992. Can. Data Rep. Fish. Aquat. Sci. 899. 77 p.

Hargreaves, N.B., D.M. Ware, and G.A. McFarlane. 1999. The return of the Pacific sardine (*Sardinops sagax*) to the British Columbia coast in 1992. Can. J. Fish. Aquat. Sci. 51: 460-463.

Hilborn, R., and C.J. Walters. 1992. Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty. Chapman Hall, New York. 570 p.

King, J.R., and R.J. Beamish. 2000. Diet compositions indicate a competitive interaction between Ocean Age – 0 chum and coho salmon. N. Pac. Anadr. Fish Comm. Bull. No. 2: 65-74.

McFarlane, G.A., and R.J. Beamish. 2001. The reoccurrence of sardines off British Columbia characterise the dynamic nature of regimes. Prog. in Oceanog. (in press).

McFarlane, G.A., and R.J. Beamish. 1999. Sardines return to British Columbia waters. Pp. 77-82. *In*: Freeland, H. W.P. Peterson, and A. Tyler [eds.]. Proceedings of the 1998 Science Board Symposium on the impacts of the 1997/98 El Nino event on the North Pacific ocean and its marginal seas. PICES Scientific Report No. 10, North Pacific Marine Science Organization, Sidney, Canada.

Table 1. Research cruises, 1992 - 2000, in which sardines were captured.

Year	Vessel	Start date	End date	Areas surveyed	Assigned #
1992	W.E. Ricker	30-Jul-92	7-Aug-92	La Perouse	92-A
1992	W.E. Ricker	20-Sep-92	2-Oct-92	SWVI	92-B
1993	W.E. Ricker	4-Aug-93	12-Aug-93	La Perouse	93-A
1994			NO SARDINES CAPTURED IN 1994		
1995	W.E. Ricker	1-Aug-95	7-Aug-95	La Perouse	95-A
1996	W.E. Ricker	30-Jul-96	5-Aug-96	La Perouse	96-A
1997	W.E. Ricker	10-Apr-97	21-Apr-97	WCVI, WCWA and JDF	97-A
	W.E. Ricker	1-Jun-97	7-Jun-97	Swiftsure	97-B
	W.E. Ricker	23-Jun-97	5-Jul-97	WCVI, QCS, JDF, WCWA	97-C
	W.E. Ricker	4-Aug-97	9-Aug-97	La Perouse	97-D
	W.E. Ricker	13-Aug-97	19-Aug-97	La Perouse	97-E
	W.E. Ricker	10-Oct-97	29-Oct-97	WCVI, Offshelf	97-F
1998	W.E. Ricker	17-Feb-98	7-Mar-98	WCVI and JDF	98-A
	W.E. Ricker	10-Apr-98	21-Apr-98	WCVI and JDF	98-B
	W.E. Ricker	1-Jun-98	20-Jun-98	Hecate strait	98-C
	W.E. Ricker	24-Jun-98	30-Jun-98	WCVI and JDF	98-D
	W.E. Ricker	6-Aug-98	21-Aug-98	WCVI, QCS	98-E
	W.E. Ricker	8-Sep-98	24-Sep-98	SOG, JDF, WCWA, SWVI	98-F
	W.E. Ricker	17-Nov-98	28-Nov-98	SOG and JDF	98-G
1999	W.E. Ricker	12-Feb-99	6-Mar-99	SOG, JDF, SWVI	99-A
	W.E. Ricker	1-Jun-99	16-Jun-99	Hecate strait	99-B
	W.E. Ricker	1-Jul-99	13-Jul-99	JDF, swiftsure, la perouse	99-C
	W.E. Ricker	4-Aug-99	8-Aug-99	WCVI	99-D
	W.E. Ricker	11-Aug-99	14-Aug-99	La Perouse, Finger Bank, 40 mile bank	99-E
	W.E. Ricker	17-Aug-99	30-Aug-99	WCVI, QCS	99-F
2000	W.E. Ricker	25-Jul-00	30-Jul-00	La Perouse	00-A
	W.E. Ricker	1-Aug-00	7-Aug-00	Swiftsure to Esperanza	00-B
	W.E. Ricker	9-Sep-00	28-Sep-00	Queen Charlotte Sound to La Perouse	00-C
	W.E. Ricker	5-Oct-00	25-Oct-00	La Perouse to Dixon Entrance	00-D

Table 2. Common names and scientific names of species captured in sardine sets, 1992 - 2000

Common Name	Scientific name
WHITEBAIT SMELT	*Allosmerus elongatus*
AMERICAN SHAD	*Alosa saidissima*
PACIFIC SANDLANCE	*Ammodytes hexapterus*
WOLF EEL	*Anarrhichthys ocellatus*
SABLEFISH	*Anoplopoma fimbria*
ARROWTOOTH FLOUNDER	*Atheressthes stomias*
PACIFIC SANDDAB	*Citharichthys sordidus*
SANDDABS	*Citharichthys* spp.
PACIFIC HERRING	*Clupea harengus pallasi*
SHINER PERCH	*Cymatogaster aggregata*
CALIFORNIA HEADLIGHTFISH	*Diapus theta*
DEEPSEA SOLE	*Embassichthys bathybius*
ANCHOVY	*Engraulis mordax*
PETRALE SOLE	*Eopsetta jordani*
SPINY LUMPSUCKER	*Eumicrotremus orbis*
SKIPJACK TUNA	*Euthynnus pelamis*
PACIFIC COD	*Gadus macrocephalus*
SOUPFIN SHARK	*Galeorhinus zyopterus*
THREESPINE STICKLEBACK	*Gasterosteus aculeatus*
STICKLEBACK	*Gasterosteus* spp.
REX SOLE	*Glyptocephalus zachirus*
BROWN IRISH LORD	*Hemilepidotus spinosus*
KELP GREENLING	*Hexagrammos decagrammus*
FLATHEAD SOLE	*Hippoglossoides elassodon*
RATFISH	*Hydrolagus colliei*
RIVER LAMPREY	*Lampetra ayresi*
PACIFIC LAMPREY	*Lampetra tridentatus*
ROCK SOLE	*Lepidopsetta bilineata*
SLIPSKIN SNAILFISH	*Liparis fucensis*
SNAKE PRICKLEBACK	*Lumpenus sagitta*
SLENDER SOLE	*Lyopsetta exilis*
PACIFIC HAKE	*Merluccius productus*
TOM COD	*Microgadus proximus*
DOVER SOLE	*Microstomus pacificus*
OCEAN SUNFISH	*Mola mola*
PINK SALMON	*Oncorhynchus gorbuscha*
CHUM SALMON	*Oncorhynchus keta*
COHO SALMON	*Oncorhynchus kisutch*
SOCKEYE SALMON	*Oncorhynchus nerka*
CHINOOK SALMON	*Oncorhynchus tshawytscha*
LINGCOD	*Ophiodon elongatus*
ENGLISH SOLE	*Parophrys vetulus*
STARRY FLOUNDER	*Platichthys stellatus*
CURLFIN SOLE	*Pleuronichthys decurrens*
PLAINFIN MIDSHIPMAN	*Porichthys notatus*
BLUE SHARK	*Prionace glauca*

Table 2 (cont'd)

Common name	Scientific Name
BIG SKATE	*Raja binoculata*
LONGNOSE SKATE	*Raja rhina*
PILE PERCH	*Rhacochilus vacca*
RONQUIL	*Ronquilus jordani*
PACIFIC SARDINE	*Sardinops sagax*
PACIFIC MACKEREL	*Scomber japonicus*
PACIFIC OCEAN PERCH	*Sebastes alutus*
REDBANDED ROCKFISH	*Sebastes babcocki*
SILVERGRAY ROCKFISH	*Sebastes brevispinus*
DUSKY ROCKFISH	*Sebastes ciliatus*
DARKBLOTCHED ROCKFISH	*Sebastes crameri*
GREENSTRIPE ROCKFISH	*Sebastes elongatus*
WIDOW ROCKFISH	*Sebastes entomelas*
YELLOWTAIL ROCKFISH	*Sebastes flavidus*
BLACK ROCKFISH	*Sebastes melanops*
BOCCACIO	*Sebastes paucispinus*
CANARY ROCKFISH	*Sebastes pinniger*
REDSTRIPE ROCKFISH	*Sebastes proriger*
SHARPCHIN ROCKFISH	*Sebastes zacentrus*
LARVAL ROCKFISH	*Sebastes* spp.
SPINY DOGFISH	*Squalus acantias*
EULACHON	*Thaleichthys pacificus*
WALLEYE POLLOCK	*Theragra chalcogramma*
JACK MACKEREL	*Trachurus symmetricus*
PACIFIC SANDFISH	*Trichodon trichodon*
FLATFISH LARVAE	Order Pleuronectiformes
JUVENILE GUNNEL	Family Pholidae
MYCTOPHID	Family Myctophidae
EELPOUT	Family Zoarcidae
SMELT	Family Osmeridae
SALPS	Subphylum Tunicata
SQUID	Class Cephalopoda

Table 3. Summary of biological data collected from sardines by set, all cruises, 1992 - 2000.

Year	Cruise	Set	Date	# fish sampled	Otoliths	Stomach	Fins	Scales	Length	Sex	Weight	Maturity
1992	92-A	19	08/04/92	2	2	-	-	-	2	2	2	2
1992	92-A	20	08/04/92	1	1	-	-	-	1	1	1	1
1992	92-A	25	08/06/92	42	42	-	-	-	42	42	42	42
1992	92-A	27	08/06/92	15	-	-	-	-	15	15	-	-
1992	92-B	2	09/22/92	1	1	-	-	-	1	1	1	1
1992	92-B	8	09/23/92	1	1	-	-	-	1	1	1	1
1992	92-B	10	09/24/92	2	2	-	-	-	2	2	2	2
1992	92-B	12	09/24/92	4	4	-	-	-	4	4	4	4
1992	92-B	13	09/24/92	3	3	-	-	-	3	3	3	3
1992	92-B	17	09/25/92	2	2	-	-	-	2	2	2	2
1992	92-B	18	09/26/92	8	8	-	-	-	8	8	8	8
1992	92-B	27	09/28/92	2	2	-	-	-	2	2	2	2
1993	93-A	4	08/05/93	6	-	-	-	-	6	6	-	6
1993	93-A	5	08/05/93	3	-	-	-	-	3	3	-	3
1993	93-A	11	08/07/93	184	-	-	-	-	184	184	184	-
1994	- NO SARDINES											
1995	- TRACE SARDINES, SET 11, CRUISE 95-A											
1996	- ONE SARDINE, SET 2, CRUISE 96-A											
1997	97-A	20	04/10/97	1	-	-	-	-	1	-	-	-
1997	97-A	57	04/15/97	1	-	-	-	-	1	-	-	-
1997	97-A	58	04/16/97	2	-	-	-	-	2	2	-	2
1997	97-A	59	04/16/97	1	-	-	-	-	1	1	-	1
1997	97-A	61	04/16/97	1	-	-	-	-	1	1	-	1
1997	97-A	83	04/19/97	1	-	-	-	-	1	1	-	-
1997	97-B	44	06/01/97	100	-	12	-	-	100	100	53	53
1997	97-B	44ob	06/01/97	280	-	-	-	-	280	280	-	-
1997	97-B	49	06/03/97	2	-	-	-	-	2	-	-	-
1997	97-B	51	06/03/97	1	-	-	-	-	1	-	-	-
1997	97-B	52	06/04/97	2	-	-	-	-	2	-	-	-
1997	97-B	56	06/04/97	2	-	-	-	-	2	-	-	-
1997	97-B	58	06/04/97	41	-	-	-	-	41	-	-	-
1997	97-B	59	06/04/97	2	-	-	-	-	2	-	-	-
1997	97-B	60	06/04/97	12	-	-	-	-	12	-	-	-
1997	97-C	44	06/24/97	2	-	-	-	-	2	2	-	-
1997	97-C	49	06/24/97	1	-	-	-	-	1	1	-	-
1997	97-C	50	06/24/97	207	-	20	-	-	207	92	52	52
1997	97-C	53	06/24/97	11	-	-	-	-	11	11	-	-
1997	97-C	54	06/24/97	1	-	-	-	-	1	1	-	-
1997	97-C	56	06/25/97	100	-	10	-	-	100	100	50	50
1997	97-C	58	06/25/97	89	-	5	-	-	89	89	41	41

Table 3 (cont'd)

Year	Cruise	Set	Date	# fish sampled	Otoliths	Stomach	Fins	Scales	Length	Sex	Weight	Maturity
1997	97-C	60	06/25/97	224	-	-	-	-	224	50	-	-
1997	97-C	62	06/26/97	2	-	-	-	-	2	-	-	-
1997	97-C	63	06/26/97	61	-	-	-	-	61	20	-	-
1997	97-C	64	06/26/97	235	-	-	-	-	235	50	-	-
1997	97-C	67	06/26/97	1	-	-	-	-	1	-	-	-
1997	97-C	70	06/26/97	1	-	-	-	-	1	-	-	-
1997	97-C	71	06/27/97	265	-	-	-	-	261	50	-	-
1997	97-C	72	06/27/97	50	-	-	-	-	50	50	-	-
1997	97-C	73	06/27/97	1	-	-	-	-	1	-	-	-
1997	97-C	75	06/27/97	300	-	20	-	-	300	100	50	50
1997	97-C	78	06/28/97	6	-	-	-	-	6	-	-	-
1997	97-C	79	06/28/97	250	-	-	-	-	250	49	-	-
1997	97-C	81	06/28/97	50	-	-	-	-	50	50	-	-
1997	97-C	84	06/28/97	200	-	-	-	-	200	50	-	-
1997	97-C	98	07/01/97	27	-	-	-	-	27	-	-	-
1997	97-C	99	07/01/97	100	-	-	-	-	100	-	-	-
1997	97-C	102	07/01/97	155	-	-	-	-	155	20	-	-
1997	97-C	109	07/02/97	12	-	-	-	-	12	-	-	-
1997	97-C	110	07/02/97	258	-	5	-	-	258	70	50	50
1997	97-C	116	07/03/97	334	-	20	-	-	334	20	-	-
1997	97-C	124	07/04/97	100	-	-	-	-	100	-	-	-
1997	97-C	137	07/05/97	1	-	-	-	-	1	-	-	-
1997	97-D	7	08/04/97	146	-	10	-	-	146	146	50	50
1997	97-D	11	08/05/97	199	-	11	-	-	199	89	160	50
1997	97-D	18	08/07/97	195	-	12	-	-	195	195	195	51
1997	97-E	10	08/17/97	102	-	10	-	-	102	102	85	10
1997	97-E	14	08/17/97	182	-	10	-	-	182	102	130	50
1997	97-F	52	10/25/97	262	-	-	-	-	262	-	-	-
1997	97-F	52a	11/20/97	91	-	10	-	-	91	91	53	53
1997	97-F	52b	11/20/97	104	-	5	-	-	104	104	50	50
1997	97-F	62	10/26/97	1	-	-	-	-	1	1	-	1
1997	97-F	67	10/26/97	1	-	-	-	-	1	-	-	-
1997	97-F	68	10/26/97	100	-	-	-	-	100	100	-	100
1997	97-F	68	11/28/97	100	-	-	-	-	100	-	-	-
1998	98-A	43	02/16/98	1	-	-	-	-	1	-	-	1
1998	98-A	45	02/17/98	100	-	-	-	-	100	-	-	100
1998	98-A	52	02/17/98	13	-	-	-	-	13	-	-	13
1998	98-A	53	02/17/98	1	-	-	-	-	1	-	-	1
1998	98-A	55	02/17/98	4	-	-	-	-	4	-	-	4
1998	98-A	59	02/17/98	1	-	-	-	-	1	-	-	1
1998	98-A	62	02/20/98	51	-	-	-	-	51	-	-	51
1998	98-A	63	02/20/98	110	-	-	-	-	110	-	-	110
1998	98-A	80	02/21/98	1	-	-	-	-	1	-	-	1

Table 3 (cont'd)

Year	Cruise	Set	Date	# fish sampled	Otoliths	Stomach	Fins	Scales	Length	Sex	Weight	Maturity
1998	98-A	85	02/22/98	16	-	-	-	-	16	-	-	16
1998	98-A	88	02/23/98	7	-	-	-	-	7	-	-	7
1998	98-A	93	02/23/98	1	-	-	-	-	1	-	-	1
1998	98-A	94	02/23/98	1	-	-	-	-	1	-	-	1
1998	98-A	102	03/04/98	1	-	-	-	-	1	-	-	1
1998	98-A	105	03/04/98	2	-	-	-	-	2	-	-	2
1998	98-A	108	03/05/98	1	-	-	-	-	1	-	-	1
1998	98-A	110	03/05/98	2	-	-	-	-	2	-	-	2
1998	98-A	111	03/06/98	35	-	-	-	-	35	-	-	35
1998	98-A	116	03/06/98	1	-	-	-	-	1	-	-	1
1998	98-A	123	03/07/98	1	-	-	-	-	1	-	-	1
1998	98-A	126	03/07/98	1	-	-	-	-	1	-	-	1
1998	98-B	42	04/12/98	1	-	-	-	-	1	-	-	1
1998	98-B	44	04/12/98	2	-	-	-	-	2	-	-	2
1998	98-B	45	04/12/98	2	2	-	-	-	2	2	-	2
1998	98-B	46	04/13/98	2	-	-	-	-	2	-	-	2
1998	98-B	48	04/13/98	5	-	-	-	-	5	-	-	5
1998	98-B	51	04/13/98	5	-	-	-	-	5	-	-	5
1998	98-B	52	04/13/98	2	-	-	-	-	2	-	-	2
1998	98-B	53	04/14/98	1	-	-	-	-	1	-	-	1
1998	98-B	56	04/14/98	6	-	-	-	-	6	-	-	6
1998	98-B	58	04/14/98	4	-	-	-	-	4	-	-	4
1998	98-B	60	04/14/98	16	-	-	-	-	16	-	-	16
1998	98-B	79	04/16/98	2	-	-	-	-	2	-	-	2
1998	98-B	90	04/18/98	1	-	-	-	-	1	-	-	1
1998	98-B	91	04/18/98	1	-	-	-	-	1	-	-	1
1998	98-B	95	04/18/98	1	-	-	-	-	1	-	-	1
1998	98-B	97	04/19/98	1	-	-	-	-	1	-	-	1
1998	98-B	109	04/20/98	1	-	-	-	-	1	-	-	1
1998	98-B	110	04/20/98	2	-	-	-	-	2	-	-	2
1998	98-C	14	06/07/98	81	-	-	-	-	81	-	-	-
1998	98-D	2	06/24/98	1	1	1	1	1	1	-	-	-
1998	98-D	4	06/24/98	10	3	10	10	9	10	1	-	1
1998	98-D	5	06/24/98	3	3	3	3	-	3	3	-	3
1998	98-D	9	06/24/98	12	12	1	-	-	12	12	-	12
1998	98-D	10	06/24/98	1	-	-	-	-	1	-	1	-
1998	98-D	11	06/24/98	47	4	47	-	-	47	4	43	4
1998	98-D	12	06/25/98	4	-	-	-	-	4	-	-	-
1998	98-D	14	06/25/98	227	62	20	-	-	227	90	116	90
1998	98-D	20	06/26/98	100	15	-	-	-	100	98	-	98
1998	98-D	28	06/27/98	11	8	11	-	-	11	11	1	1
1998	98-D	29	06/27/98	3	-	-	-	-	3	-	-	-
1998	98-D	30	06/27/98	248	70	100	-	-	248	248	-	98
1998	98-D	33	06/27/98	24	24	-	-	-	24	24	-	24

Table 3 (cont'd)

Year	Cruise	Set	Date	# fish sampled	Otoliths	Stomach	Fins	Scales	Length	Sex	Weight	Maturity
1998	98-D	34	06/27/98	133	50	50	-	-	133	133	-	50
1998	98-D	35	06/28/98	100	15	50	-	-	100	100	-	-
1998	98-E	14	08/11/98	16	16	14	-	-	16	16	16	16
1998	98-E	24	08/17/98	23	23	-	-	-	23	-	23	-
1998	98-F	105	09/18/98	84	15	-	-	-	84	15	68	15
1998	98-F	105ob	09/18/98	196	-	-	-	-	196	-	-	-
1998	98-F	116	09/19/08	64	27	26	27	26	64	34	30	34
1998	98-F	116ob	09/19/98	208	-	-	-	-	208	-	-	-
1998	98-F	118	09/19/98	3	-	-	-	-	3	-	-	-
1998	98-F	119	09/19/98	2	-	-	-	-	2	-	-	-
1998	98-F	121	09/19/98	28	-	-	-	-	28	-	-	-
1998	98-G	1	11/17/98	1	-	-	-	-	1	-	-	-
1998	98-G	11	11/17/98	3	-	-	-	-	3	-	-	-
1998	98-G	24	11/19/98	2	-	-	-	-	2	-	-	-
1998	98-G	25	11/19/98	68	-	-	-	-	68	-	-	-
1998	98-G	35	11/20/98	1	-	-	-	-	1	-	-	-
1998	98-G	42	11/20/98	1	-	-	-	-	1	-	-	-
1998	98-G	46	11/20/98	1	-	-	-	-	1	-	-	-
1998	98-G	49	11/21/98	3	-	-	-	-	3	-	-	-
1998	98-G	93	11/25/98	26	-	-	-	-	26	-	-	-
1998	98-G	94	11/25/98	3	-	-	-	-	3	-	-	-
1998	98-G	96	11/25/98	9	-	-	-	-	9	-	-	-
1998	98-G	98	11/25/98	1	-	-	-	-	1	-	-	-
1998	98-G	100	11/26/98	57	-	-	-	-	57	-	-	-
1998	98-G	101	11/26/98	100	-	37	-	-	100	37	-	-
1998	98-G	103	11/26/98	50	-	-	-	-	50	-	-	-
1998	98-G	108	11/27/98	2	-	-	-	-	2	-	-	-
1998	commercial data	8	1998	923					923			
1999	99-A	77	03/01/99	1	-	-	-	-	1	-	-	-
1999	99-A	78	03/01/99	1	-	-	-	-	1	-	-	-
1999	99-A	79	03/01/99	75	-	-	-	-	75	-	-	-
1999	99-A	80	03/01/99	100	-	-	-	-	100	-	-	-
1999	99-A	83	03/02/99	2	-	-	-	-	2	-	-	-
1999	99-A	84	03/02/99	1	-	-	-	-	1	-	-	-
1999	99-A	85	03/02/99	15	-	-	-	-	15	-	-	-
1999	99-A	86	03/02/99	4	-	-	-	-	4	-	-	-
1999	99-A	87	03/02/99	79	-	-	-	-	79	-	-	-
1999	99-A	93	03/04/99	1	-	-	-	-	1	-	-	-
1999	99-A	95	03/04/99	1	-	-	-	-	1	-	-	-
1999	99-A	97	03/04/99	27	-	-	-	-	27	-	-	-

Table 3 (cont'd)

Year	Cruise	Set	Date	# fish sampled	Otoliths	Stomach	Fins	Scales	Length	Sex	Weight	Maturity
1999	99-A	98	03/04/99	4	-	-	-	-	4	-	-	-
1999	99-A	102	03/04/99	1	-	-	-	-	1	-	-	-
1999	99-A	103	03/04/99	4	-	-	-	-	4	-	-	-
1999	99-A	105	03/05/99	1	-	-	-	-	1	-	-	-
1999	99-A	120	03/06/99	7	-	-	-	-	7	-	-	-
1999	99-A	121	03/06/99	6	-	-	-	-	6	-	-	-
1999	99-C	116	07/10/99	336	50	90	-	-	336	90	50	50
1999	99-C	125	07/11/99	190	50	70	-	-	190	70	50	50
1999	99-C	130	07/11/99	150	50	-	-	-	150	50	50	50
1999	99-C	142	07/12/99	100	-	-	-	-	100	-	-	-
1999	99-C	146	07/13/99	171	50	70	-	-	171	70	50	50
1999	99-D	1	08/04/99	170	50	20	-	-	170	170	20	50
1999	99-D	8	08/05/99	150	50	-	-	-	150	150	-	50
1999	99-D	14	08/05/99	177	50	20	-	-	177	177	20	50
1999	99-D	19	08/06/99	150	50	-	-	-	150	150	-	50
1999	99-D	21	08/06/99	67	-	-	-	-	67	67	-	-
1999	99-D	29	08/07/99	120	-	20	-	-	120	120	20	-
1999	99-D	40	08/08/99	176	50	20	-	-	176	176	20	50
1999	99-D	46	08/08/99	170	50	20	-	-	170	170	20	20
1999	99-E	2	08/11/99	100	-	-	-	-	100	100	100	-
1999	99-E	13	08/13/99	100	-	-	-	-	100	100	100	-
1999	99-E	16	08/14/99	150	50	-	-	-	150	150	150	50
1999	99-F	1	08/17/99	13	-	-	-	-	13	-	13	-
1999	99-F	5	08/17/99	243	50	50	-	-	243	50	243	50
1999	99-F	8	08/17/99	167	50	50	-	-	167	50	167	50
1999	99-F	11	08/19/99	3	-	-	-	-	3	3	3	3
1999	99-F	12	08/19/99	5	-	-	-	-	5	5	5	5
1999	99-F	13	08/19/99	3	-	-	-	-	3	3	3	3
1999	99-F	16	08/19/99	169	50	50	-	-	169	50	169	50
1999	99-F	23	08/20/99	7	-	-	-	-	7	7	7	7
1999	99-F	26	08/20/99	189	50	50	-	-	189	-	189	-
1999	99-F	27	08/20/99	69	-	-	-	-	69	69	69	69
1999	99-F	28	08/20/99	180	50	50	-	-	180	50	180	-
1999	99-F	29	08/20/99	20	-	-	-	-	20	20	20	20

Table 3 (cont'd)

Year	Cruise	Set	Date	# fish sampled	Otoliths	Stomach	Fins	Scales	Length	Sex	Weight	Maturity
2000	00-B	8	08/01/00	123	50	50	-	-	123	50	123	50
2000	00-B	9	08/01/00	7	-	-	-	-	7	-	7	-
2000	00-B	11	08/01/00	1	-	-	-	-	2	-	1	-
2000	00-B	13	08/02/00	3	-	-	-	-	3	-	3	-
2000	00-B	24	08/03/00	1	-	-	-	-	1	-	1	-
2000	00-B	33	08/04/00	7	-	-	-	-	7	-	7	-
2000	00-B	34	08/04/00	1	-	-	-	-	1	-	1	-
2000	00-B	35	08/04/00	34	34	34	-	-	34	34	34	34
2000	00-B	54	08/06/00	9	-	-	-	-	9	-	-	-
2000	00-B	55	08/06/00	1	-	-	-	-	1	-	-	-
2000	00-B	58	08/06/00	164	-	-	-	-	164	-	-	-
2000	00-B	63	08/06/00	1	-	-	-	-	1	-	-	-
2000	00-B	64	08/07/00	207	50	50	-	-	207	50	50	50
2000	00-B	68	08/07/00	284	50	50	-	-	284	100	100	100
2000	00-C	165	09/27/00	1	-	1	-	-	1	-	-	-
2000	00-C	169	09/27/00	130	-	30	-	-	130	30	-	-
2000	00-C	170	09/27/00	19	-		-	-	19	-	-	-
2000	00-C	179	09/28/00	160	-	40	-	-	160	40	-	-
2000	00-D	LP02	10/04/00	50	-	-	-	-	50	-	-	-
2000	00-D	EP01	10/05/00	50	-	-	-	-	50	-	-	-
2000	00-D	K05	10/07/00	6	-	-	-	-	6	-	-	-
2000	00-D	X49	10/29/00	100	-	-	-	-	100	-	-	-

Table 4. Length - frequency summary from research and commercial fishery samples, 1992 - 2000.

length (cm)	1992	1993	1997	1998	1998 J/V*	1999	2000
5	-	-	-	1	-	-	-
6	-	-	-	0	-	-	-
7	-	-	-	14	-	-	-
8	-	-	-	52	-	-	-
9	-	-	-	77	-	-	-
10	-	-	-	91	16	-	-
11	-	-	-	146	30	-	-
12	-	-	-	87	13	-	-
13	-	-	-	8	3	-	-
14	-	-	1	15	0	1	-
15	-	-	0	44	0	36	-
16	-	-	0	62	0	125	-
17	-	-	9	38	0	127	-
18	-	-	11	8	0	102	-
19	-	-	20	8	0	276	-
20	-	-	85	51	30	112	1
21	7	4	165	83	56	46	3
22	11	22	516	231	139	259	10
23	19	41	1347	353	256	733	129
24	6	43	1578	546	211	1064	397
25	14	36	741	291	105	739	488
26	10	41	259	104	45	198	256
27	8	5	130	25	19	32	60
28	7	1	43	12	-	13	15
29	0	-	18	1	-	4	1
30	0	-	6	1	-	-	-
31	1	-	2	-	-	-	-
32	-	-	1	-	-	-	-
33	-	-	3	-	-	-	-
34	-	-	4	-	-	-	-
35	-	-	1	-	-	-	-
	83	193	4940	2349	923	3867	1360

* 1998 J/V is length data obtained from observers on commercial fishing vessels, April - August, 1998

Table 5. Sardine age frequency by year, 1992 - 1999.

Year	1992	1997	1998	1999
Age				
1	2	-	-	-
2	38	2	7	-
3	14	21	45	25
4	12	74	80	61
5	5	35	43	43
6	2	3	4	7
7	1	-	2	-
8	2	-	-	-
TOTAL	76	135	181	136

Table 6. Stomach contents (cc), from samples analysed on-board and in-lab, WCVI cruises 1997-1999.

Date	# of stomachs	Digested Matter	Sardine Scales	Euphausiid	Phyto-plankton	Euphausiid Eggs	Oikopleura	Calanoid	Copepod Eggs	Crab Megalops	Filamentous Algae	Crab Zoea
1997												
June	61	38.26	4.58	0.24	-	-	-	-	-	0.59	-	0.59
July	11	4.26	0.54	0.00	-	-	-	-	-	-	-	-
August	53	35.54	10.61	3.55	-	-	-	-	1.10	-	-	-
October	15	6.80	6.90	0.10	-	-	-	-	-	-	-	-
1997 Total	140	84.86	22.63	3.89	0.00	0.00	0.00	0.00	1.10	0.59	0.00	0.59
1998												
June	57	5.27	4.25	1.30	11.09	6.62	-	0.06	-	0.38	0.75	-
August	14	0.00	0.00	9.70	-	-	-	0.89	-	0.01	-	-
September	45	0.94	6.51	0.06	-	-	-	0.22	-	-	-	-
1998 Total	116	6.21	10.75	11.06	11.09	6.62	0.00	1.18	0.00	0.39	0.75	0.00
1999												
July	51	2.14	0.00	0.05	0.74	0.45	5.11	2.87	0.00	0.00	0.01	0.12
Total (cc)	307	93.2	33.4	15.0	11.8	7.1	5.1	4.1	1.1	1.0	0.8	0.7

Date	# of stomachs	Amphipod	Eggs	Hyperid	Fish Larvae	Fish Eggs	Juvenile Shrimp	Barnacle Nauplii	Gastropod	Cladocera	Cyclopoid	Barnacle Cypris	Total Volume
1997													
June	61	-	-	0.03	-	-	0.21	-	-	-	-	-	44.5
July	11	-	-	-	-	-	-	-	-	-	-	-	4.8
August	53	-	-	-	-	-	-	-	-	-	-	-	50.8
October	15	-	-	-	-	-	-	-	-	-	-	-	14
1997 Total	140	0.00	0.00	0.30	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	114.1
1998													
June	57	-	-	-	-	-	-	0.10	0.05	-	0.03	0.01	30.76
August	14	0.52	-	-	0.24	-	-	-	-	-	-	-	11.4
September	45	0.02	-	-	-	-	-	0.01	0.04	-	-	-	7.38
1998 Total	116	0.54	0.00	0.00	0.24	0.00	0.00	0.11	0.09	0.00	0.03	0.01	49.54
1999													
July	51	0.06	0.30	0.00	0.00	0.23	0.00	0.01	0.00	0.03	0.00	0.01	12.1
Total (cc)	307	0.6	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.03	0.03	0.02	175.7

Table 7. Measures of importance for prey items from sardine stomach data, 1997 - 1999.

		OIKOPLEURA	PHYTOPLANKTON	EUPHAUSIID EGG	EUPHAUSIID	CALANOID	ALGAE	AMPHIPOD	EGGS	FISH EGGS	JUVENILE CRAB	OTHER
1997	%FO	0	0	0	58.1	6.45	0	3.23	22.6	0	35.5	6.45
31 stomachs	%C	0	0	0	13.2	0.48	0	0.32	10.3	0	2.9	0.65
Total volume:	%V	0	0	0	57.7	1.62	0	0.46	18.8	0	18.16	3.69
6.5 cc	RI	0	0	0	4119.3	13.55	0	2.52	657.66	0	747.63	27.96
1998	%FO	0	53	53	23	39	5	9	0	1	3	22
100 stomachs	%C	0	22	12	13	2	2	1	0	0.001	1	1
Total volume:	%V	0	33.9	20.2	33.8	3.6	2.29	1.64	0	0.003	1.18	1.5
32.7 cc	RI	0	2962.7	1706.6	1076.4	218.4	21.5	23.8	0	0.004	6.5	55.0
1999	%FO	90.2	78.4	60.8	3.9	92.2	2	2	54.7	19.6	2	7.8
49 stomachs	%C	42	6	4	0.2	23	0.2	0.4	2	1	0.4	0.01
Total volume:	%V	51	7.4	4.5	0.5	29	0.1	0.6	3	2.3	1.2	0.51
9.96 cc	RI	8388.6	1050.6	516.8	2.7	4794.4	0.6	2	273.5	64.68	3.2	4.02

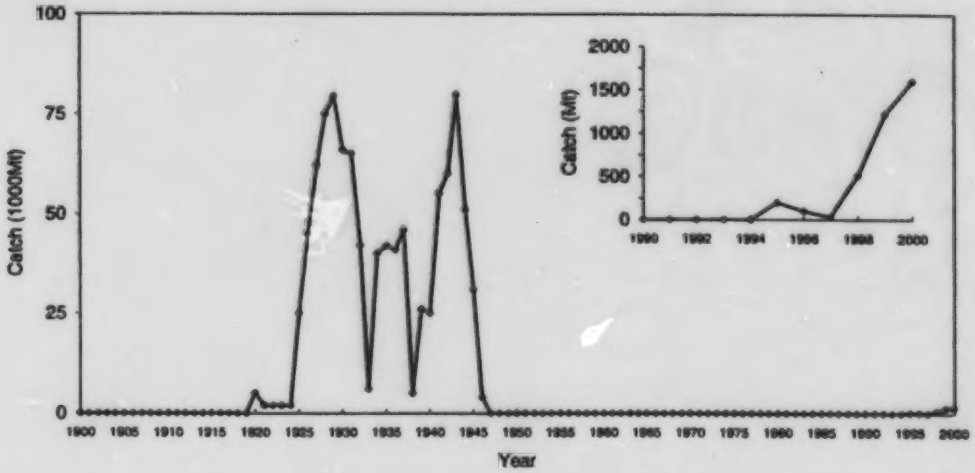


Fig. 1. Pacific sardine landings, British Columbia, 1900 – 2000.

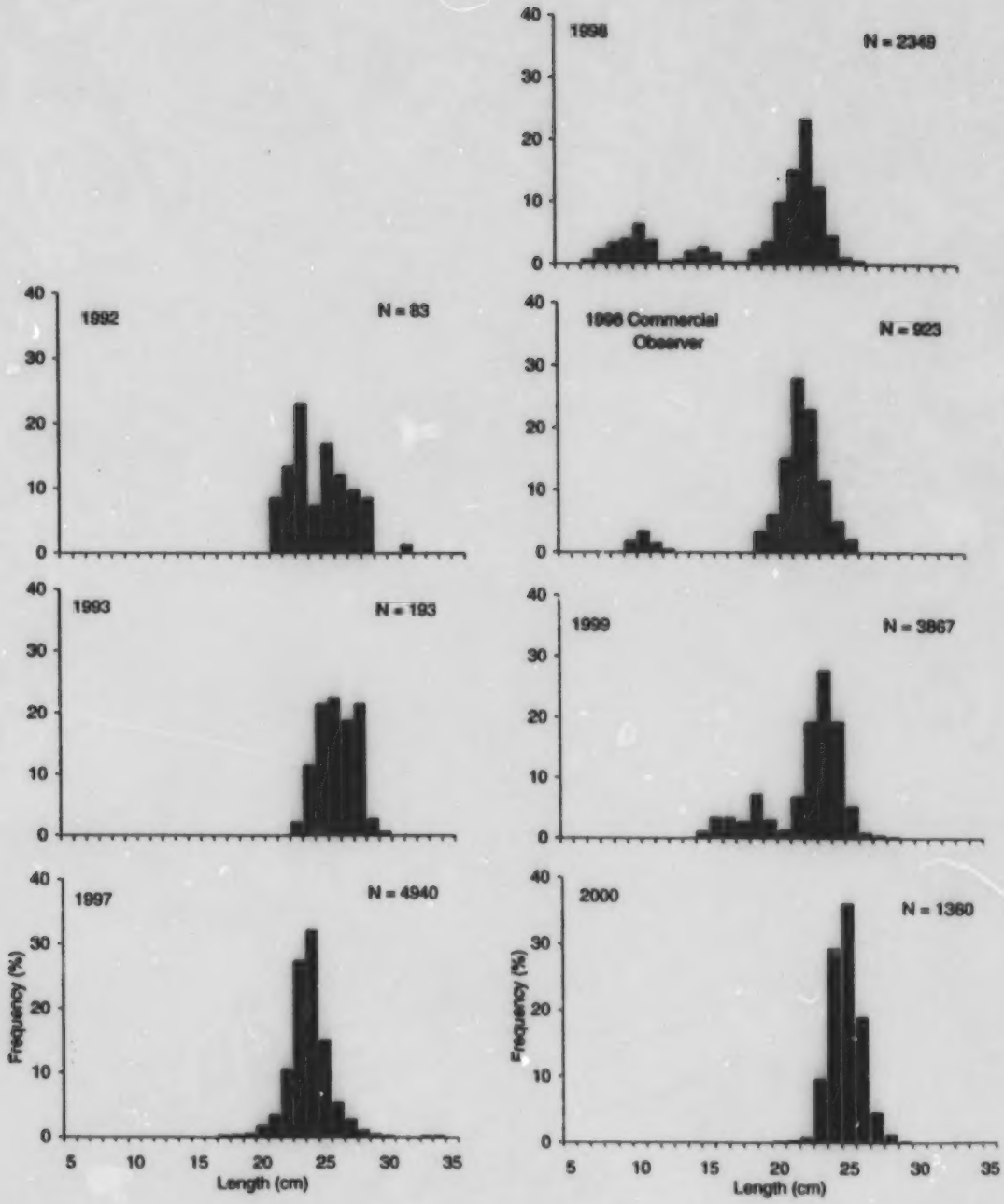


Fig. 2. Length frequency by year, 1992 – 2000.

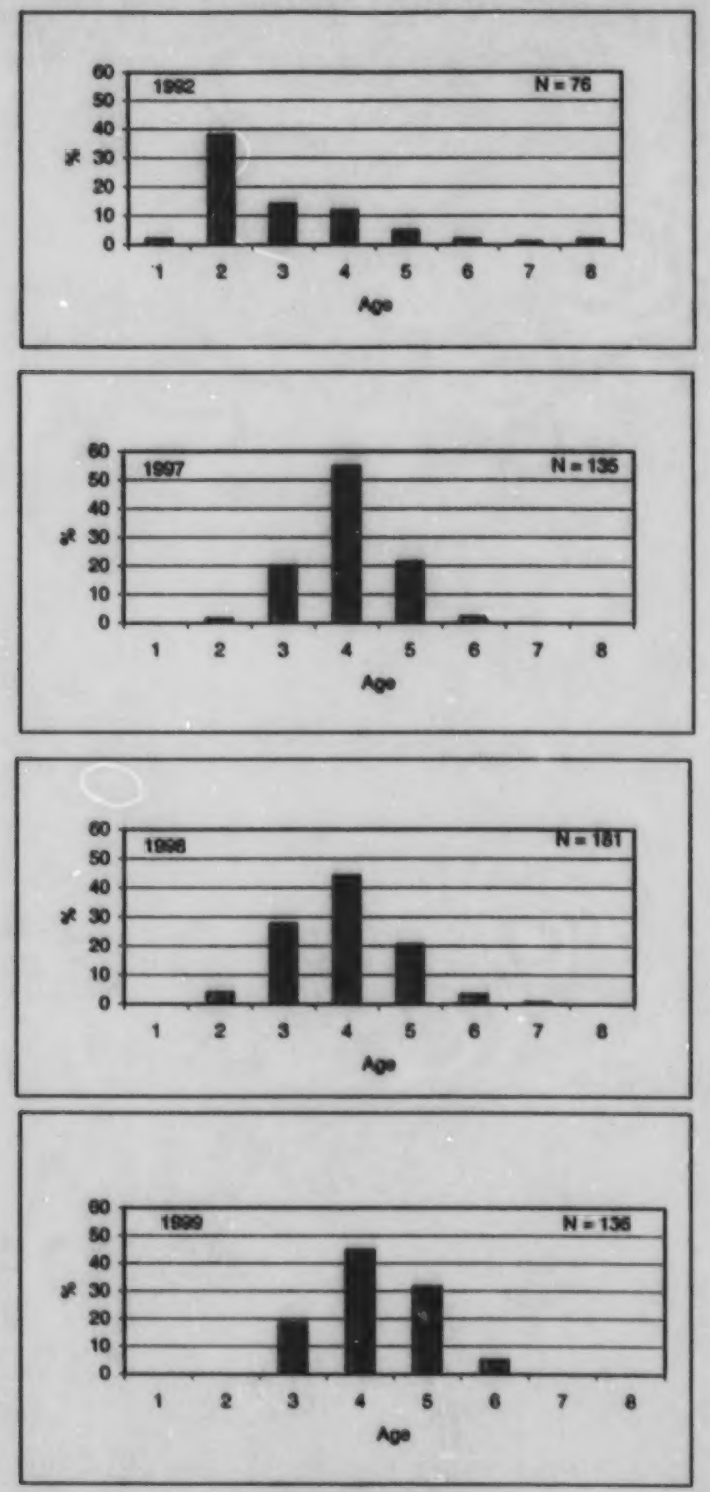


Fig. 3. Sardine age frequencies, 1992 – 1999.

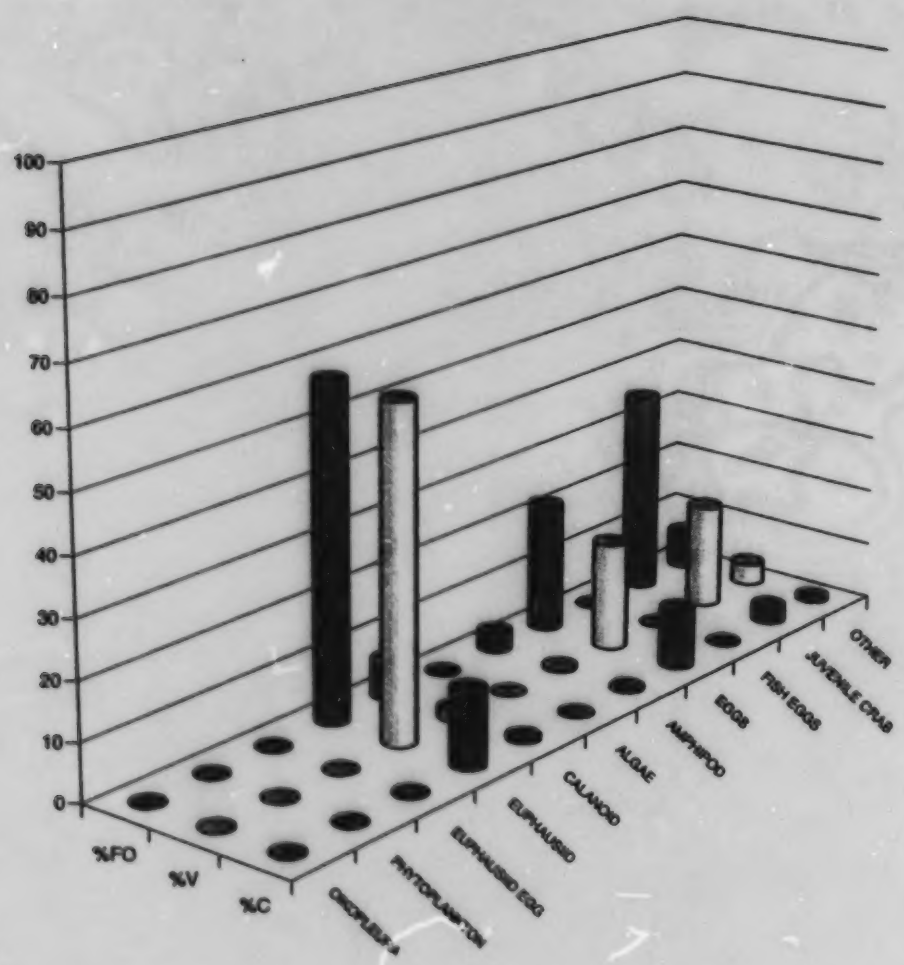


Fig. 4. Percent Frequency of Occurrence, percent Volume and percent contents values for prey items identified in sardine stomachs, 1997.

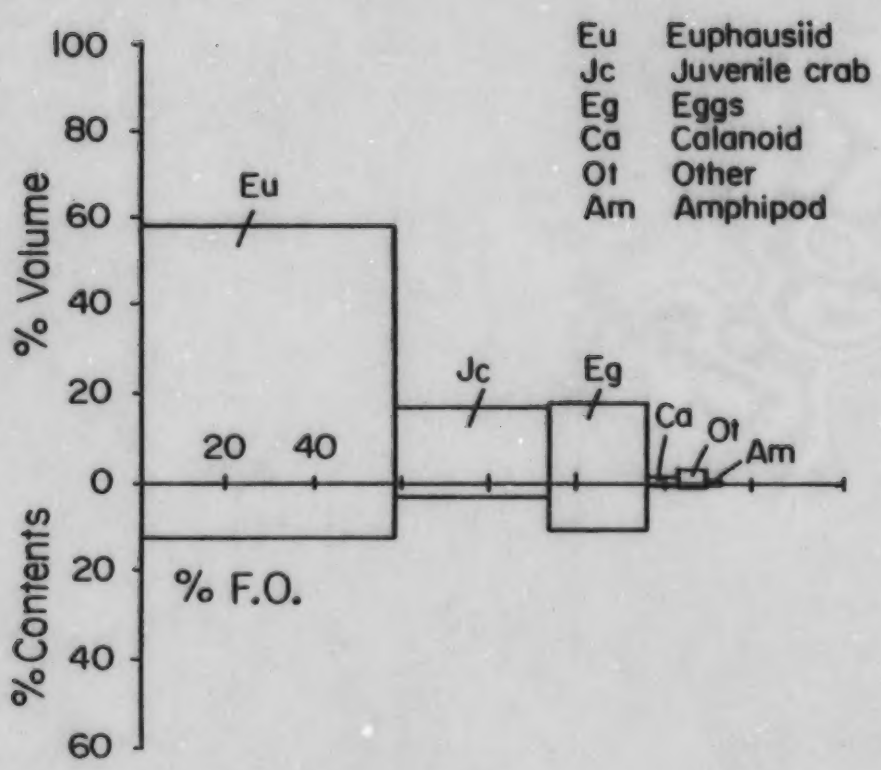


Fig. 5. Three-way plot of percentage frequency of occurrence (%F.O.), percent total volume (%V), and percent contents (%C) for each major prey item for sardines, 1997. The area contained within each prey box represents the index of relative importance (i.e. %F.O.(%C+%V)). Note that the %F.O. axis is not a continuum from zero to 100%. The units along this axis are in 20% intervals and are intended to provide reference only.

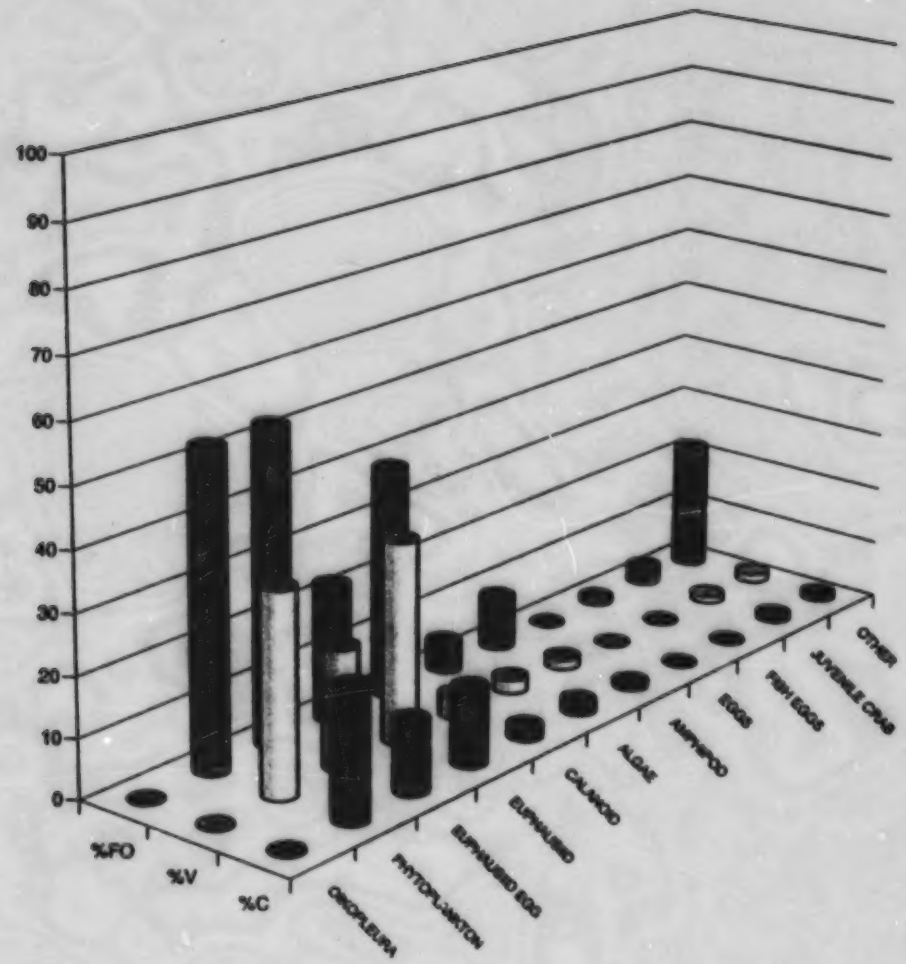


Fig 6. Percent Frequency of Occurrence, percent Volume and percent Contents values for prey items identified in sardine stomachs, 1998.

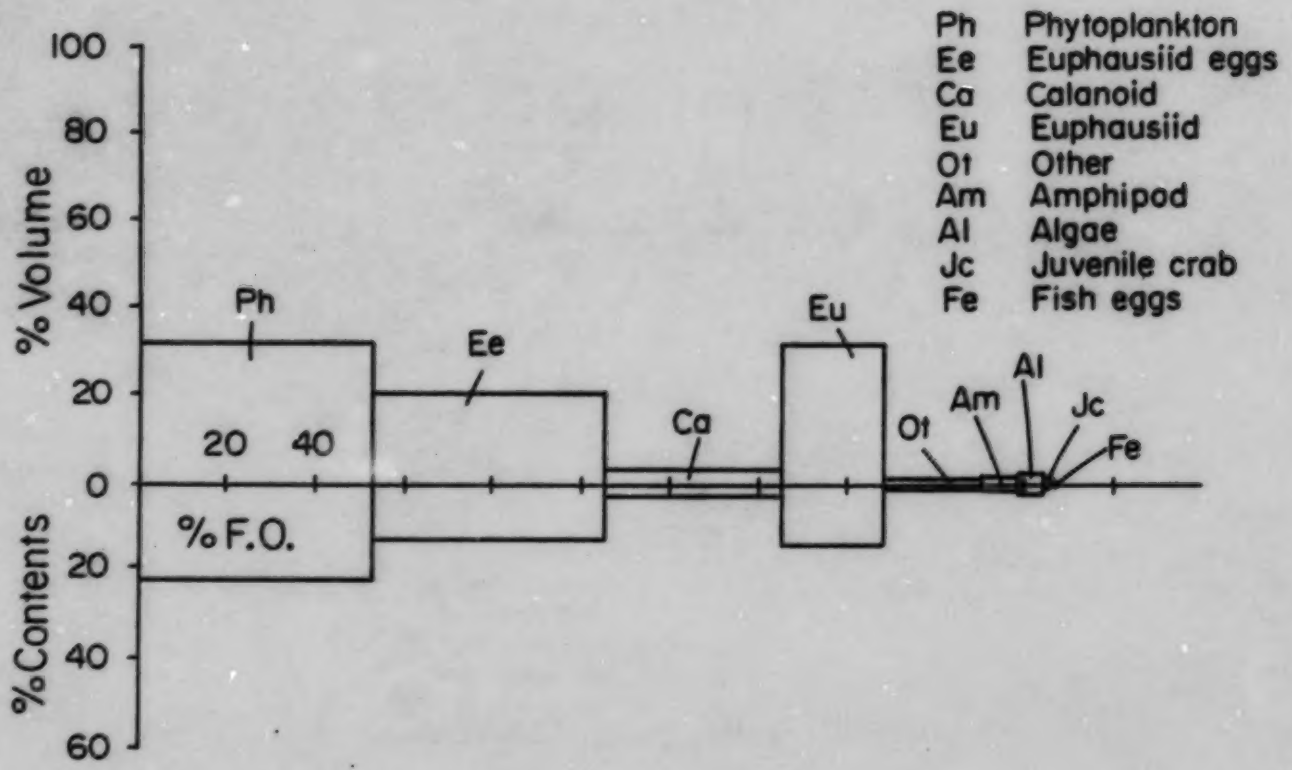


Fig. 7. Three-way plot of percentage frequency of occurrence (%F.O.), percent total volume (%V), and percent contents (%C) for each major prey item for sardines, 1998. The area contained within each prey box represents the index of relative importance (i.e. %F.O. (%C + %V)). Note that the %F.O. axis is not a continuum from zero to 100%. The units along this axis are in 20% intervals and are intended to provide reference only.

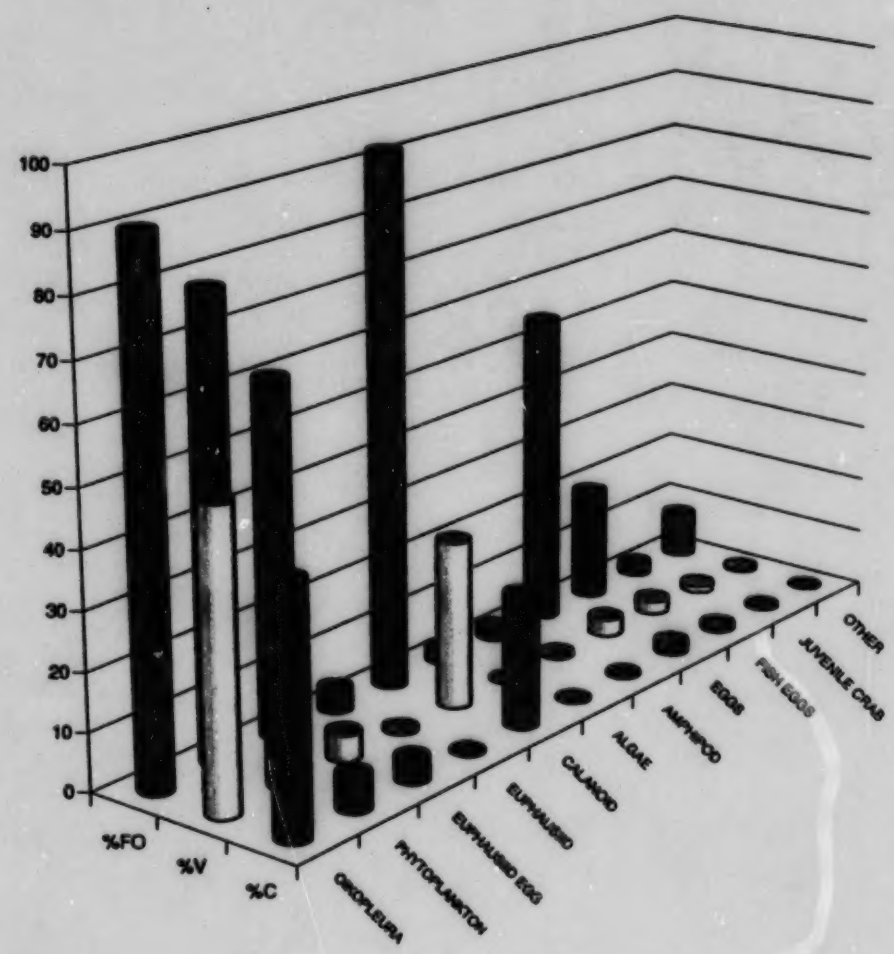


Fig. 8. Percent Frequency of Occurrence, percent Volume and percent Contents values for prey items identified in sardine stomachs, 1999.

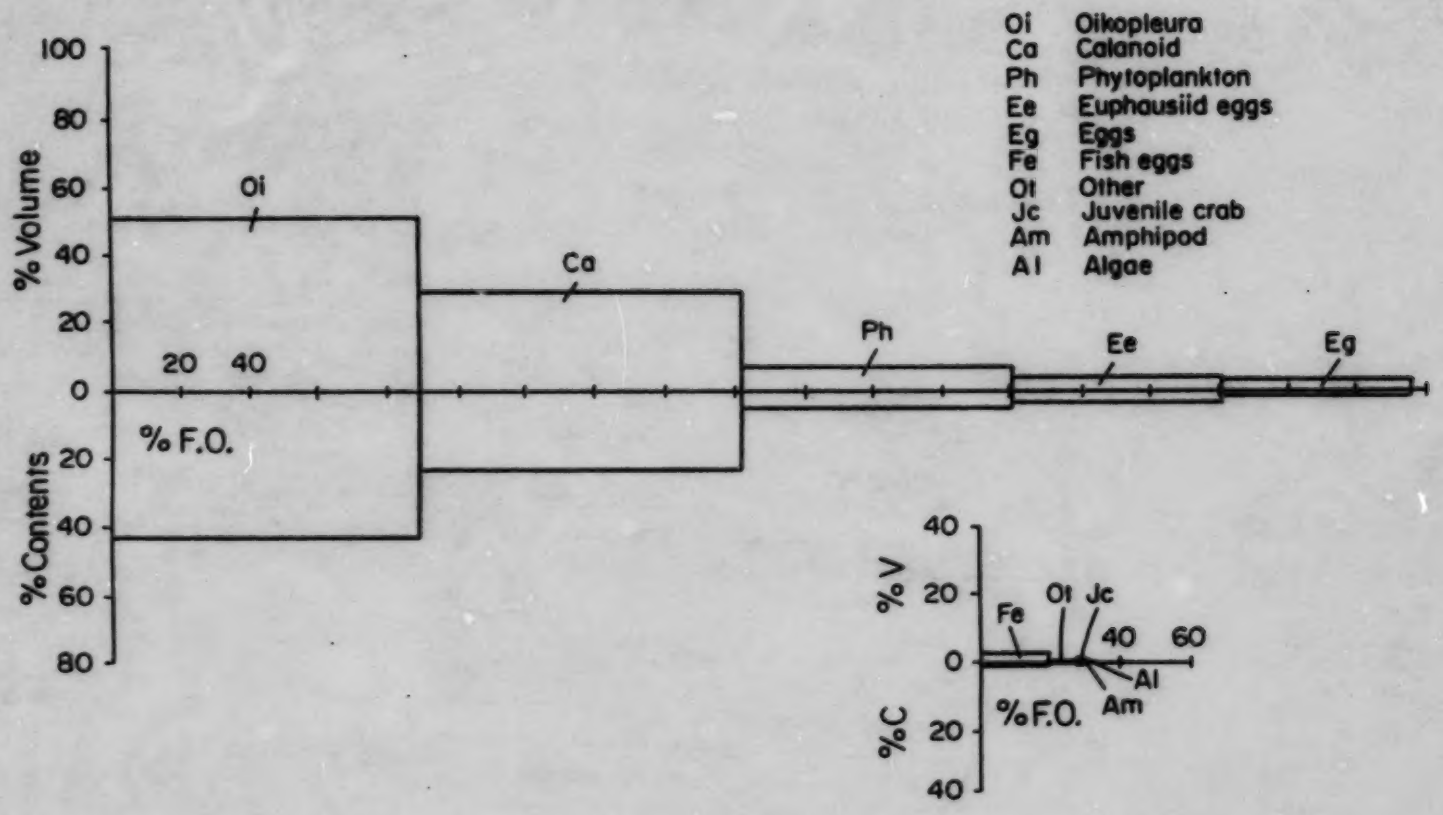


Fig. 9. Three-way plot of percentage frequency of occurrence (%F.O.), percent total volume (%V), and percent contents (%C) for each major pre item for sardines, 1999. The area contained within each prey box represents the index of relative importance (i.e. %F.O. (%C +%V)). Note that the %F.O. axis is not a continuum from zero to 100%. The units along this axis are in 20% intervals and are intended to provide reference only

Appendix 1. Set data, Cruise 92-A, La Perouse, July 30 – August 7, 1992. Data is presented for sets with sardine catch only.[a]

Set Number	19	20	25	26	27
Area	La Perouse	La Perouse	La Perouse	La Perouse	La Perouse
Date	08/04/92	08/05/92	08/06/92	08/06/92	08/06/92
Depth (m)	81	106	57.5	30	77.5
Latitude	48.54	48.73	48.68	48.70	48.69
Longitude	-125.44	-125.59	-125.61	-125.48	-125.52
Effort (hr)	1.35	0.42	1.00	0.83	1.10
Net headrope temp (°C)	6.40	7.90	-	-	-
Sardine catch (kg)	0.17	0.17	1.32	0.17	0.50
Sardine catch per hour (kg/hr)	0.12	0.40	1.32	0.20	0.45
PACIFIC SARDINE (kg)	0.17	0.17	1.32	0.17	0.50
SPINY DOGFISH (kg)	43	86	396	133	475
PACIFIC HAKE (kg)	-	7294	109	-	136
CHINOOK (kg)	5	-	3	-	10
PACIFIC HERRING (kg)	528	50	17	-	102
PACIFIC MACKEREL (kg)	-	7	3	-	-
JACK MACKEREL (kg)	-	10	31	48	57
AMERICAN SHAD (kg)	-	2	1	-	1
PACIFIC HALIBUT (kg)	-	50	-	-	-
YELLOWTAIL ROCKFISH (kg)	607	-	-	300	-
WIDOW ROCKFISH (kg)	-	-	-	3	-
REDSTRIPE ROCKFISH (kg)	-	-	-	trace	-

[a]From July 30 to August 7, 1992, total of 35 sets were completed in the La Perouse area, from 48.96°N, 128.19°W to 48.26°N, 125.45°W, using a midwater rope trawl. A total of 11 sets were made in surface waters (≤ 45m). Sardines were captured in 5 sets, four of which were deeper than 45m, and were likely caught as the net was retrieved (Appendix 1a). Other species captured along with sardines included Pacific hake, Pacific herring, spiny dogfish, and yellowtail rockfish.

Appendix 1a. Cruise 92-A, July 30 – august 7, 1992. X's represent sets at depths of 45m or shallower in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 1b. Length frequency data, Cruise 92-A, July 30 - August 7, 1992.

	19		20		25		27		Total	
Set #	M	F	M	F	M	F	M	F	M	F
Length (cm)										
20	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	4	1	2	-	6	1
22	1	-	-	-	5	4	0	-	6	4
23	1	-	-	-	6	3	3	1	10	4
24	-	-	-	-	0	1	1	1	1	2
25	-	-	-	-	3	5	3	-	6	5
26	-	-	-	1	1	3	2	-	3	4
27	-	-	-	-	0	2	1	-	1	2
28	-	-	-	-	2	2	-	-	2	2
29	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-
Total									35	24

Appendix 1c. Age frequency data, Cruise 92-A, July 30 - August 7, 1992.

Set #	19	20	25	27	Total
Age					
1	-	-	1	1	2
2	1	-	26	5	32
3	1	1	6	1	9
4	-	-	4	1	5
5	-	-	1	1	2
6	-	-	1	1	2
7	-	-	0	-	0
8	-	-	1	-	1
Total					53

Appendix 1d. Maturity - frequency data, Cruise 92-A, July 30 - August 7, 1992.

Set #	19	20	25	Total
Maturity				
12	1	1	36	38
2	-	-	6	6
r1	1	1	-	2
Total				46

Appendix 2. Set data, Cruise 92-B, west coast of Vancouver Island, September 20 – October 2, 1992. Data is presented for sets with sardine catch only.[a]

Set Number	2	8	10	11	12
Area	Barkley Sound	Barkley Sound	Clayoquot	Clayoquot	Clayoquot
Date	09/22/92	09/23/92	09/24/92	09/24/92	09/24/92
Depth (m)	75	101	80	70	77
Latitude	48.70	48.67	48.87	48.89	48.91
Longitude	-125.80	-125.68	-125.79	-125.73	-125.66
Effort (hr)	0.47	1.92	1.25	0.92	1.25
Net headrope temp (°C)	-	-	-	-	-
Sardine catch (kg)	0.17	0.50	0.33	0.17	0.33
Sardine catch per hour (kg/hr)	0.35	0.26	0.26	0.18	0.26
PACIFIC SARDINE (kg)	0.17	0.50	0.33	0.17	0.33
SPINY DOGFISH (kg)	31	15	39	27	-
PACIFIC HAKE (kg)	-	37	4	-	-
LINGCOD (kg)	12	19	-	-	-
DOVER SOLE (kg)	-	-	trace	-	-
PACIFIC MACKEREL (kg)	-	-	-	-	-
JACK MACKEREL (kg)	-	-	-	-	-
CANARY ROCKFISH (kg)	-	trace	-	-	-
SHARPCHIN ROCKFISH (kg)	-	2	-	-	-
GREENSTRIPE ROCKFISH (kg)	-	-	-	-	-
BOCCACIO (kg)	-	-	-	-	-
RATFISH (kg)	-	-	8	-	-
EULACHON (kg)	-	-	1	trace	-
TOM COD (kg)	-	-	2	14	10
PACIFIC COD (kg)	-	-	8	65	2
PACIFIC HERRING (kg)	-	-	1	-	trace
CHINOOK (kg)	-	-	6	-	4
SHINER PERCH (kg)	-	-	-	trace	-
PILE PERCH (kg)	-	-	-	-	-
PETRALE SOLE (kg)	3	trace	-	-	-
ROCK SOLE (kg)	5	1	-	trace	-
ENGLISH SOLE (kg)	-	-	-	2	trace
REX SOLE (kg)	trace	trace	trace	1	2
CURLFIN SOLE (kg)	-	-	-	trace	-
TURBOT (kg)	1	trace	-	-	-
SANNDABS (kg)	1	-	trace	trace	-
RONQUIL (kg)	trace	-	-	-	-
SABLEFISH (kg)	trace	5	-	-	-
LONGNOSE SKATE (kg)	6	-	-	5	-
AMERICAN SHAD (kg)	-	-	-	-	-
WALLEYE POLLOCK (kg)	-	4	66	-	trace
YELLOWTAIL ROCKFISH (kg)	-	3	-	-	-
SILVERGRAY ROCKFISH (kg)	-	3	-	-	-
REDSTRIPE ROCKFISH (kg)	-	6	-	trace	-

Appendix 2 (cont'd)

Set Number	13	17	18	27
Area	Clayoquot	Clayoquot	Barkley Sound	Clayoquot
Date	09/24/92	09/25/92	09/26/92	09/28/92
Depth (m)	64	64	101	73
Latitude	48.86	48.87	48.63	48.98
Longitude	-125.80	-125.73	-125.60	-125.72
Effort (hr)	0.83	1.33	1.17	1.33
Net headrope temp (°C)	-	-	-	-
Sardine catch (kg)	0.50	0.66	1.32	0.83
Sardine catch per hour (kg/hr)	0.60	0.50	1.13	0.62
PACIFIC SARDINE (kg)	0.50	0.66	1.32	0.83
SPINY DOGFISH (kg)	17	42	147	32
PACIFIC HAKE (kg)	-	-	66	-
LINGCOD (kg)	-	-	5	trace
DOVER SOLE (kg)	trace	trace	3	trace
PACIFIC MACKEREL (kg)	-	1	-	1
JACK MACKEREL (kg)	-	-	-	2
CANARY ROCKFISH (kg)	-	trace	-	-
SHARPCHIN ROCKFISH (kg)	-	-	trace	-
GREENSTRIPE ROCKFISH (kg)	-	-	trace	-
BOCCACIO (kg)	-	-	-	trace
RATFISH (kg)	-	64	5	354
EULACHON (kg)	trace	-	trace	-
TOM COD (kg)	1	4	-	39
PACIFIC COD (kg)	-	-	41	trace
PACIFIC HERRING (kg)	trace	trace	-	trace
CHINOOK (kg)	8	-	-	1
SHINER PERCH (kg)	-	-	-	trace
PILE PERCH (kg)	-	-	-	trace
PETRALE SOLE (kg)	-	-	2	-
ROCK SOLE (kg)	-	trace	trace	-
ENGLISH SOLE (kg)	trace	trace	2	-
REX SOLE (kg)	3	trace	4	trace
CURLFIN SOLE (kg)	-	-	-	-
TURBOT (kg)	-	-	5	-
SANNDABS (kg)	trace	trace	4	-
RONQUIL (kg)	-	-	-	-
SABLEFISH (kg)	-	-	39	trace

Appendix 2 (cont'd)

Set Number	13	17	18	27
Area	Clayoquot	Clayoquot	Barkley Sound	Clayoquot
Date	09/24/92	09/25/92	09/26/92	09/28/92
Depth (m)	64	64	101	73
Latitude	48.86	48.87	48.63	48.98
Longitude	-125.80	-125.73	-125.60	-125.72
Effort (hr)	0.83	1.33	1.17	1.33
Net headrope temp (°C)	-	-	-	-
Sardine catch (kg)	0.50	0.66	1.32	0.83
Sardine catch per hour (kg/hr)	0.60	0.50	1.13	0.62
LONGNOSE SKATE (kg)	-	-	-	-
AMERICAN SHAD (kg)	-	-	trace	-
WALLEYE POLLOCK (kg)	trace	-	6	13
YELLOWTAIL ROCKFISH (kg)	-	-	-	-
SILVERGRAY ROCKFISH (kg)	-	-	-	-
REDSTRIPE ROCKFISH (kg)	-	-	trace	-

[a]From September 20 to October 2, 1992, a total of 42 sets were completed during a juvenile Pacific cod survey in the La Perouse area, from 48.98°N, 125.73°W to 48.29°N, 123.35°W, using a Yankee 36 bottom trawl net. One set was made in shallow waters (≤ 45m). However, sardines were captured in 9 sets, all of which were deeper than 45m, and sardines were likely caught as the net was retrieved (Appendix 2b). Other species captured in the sets with sardines included spiny dogfish, Pacific hake, lingcod and Pacific cod.

Appendix 2a. Cruise 92-B, September 20 – October 2, 1992. All sets deeper than 45m. Numbered dots represent sets in which sardines were captured.

Appendix 2b. Length frequency data, Cruise 92-B, September 20 - October 2, 1992.

	2		8		10		11		12		13		17		18		27		Totals	
Set #	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Length (cm)																				
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
23	-	-	-	-	-	-	-	1	-	1	1	-	-	1	1	-	-	-	2	3
24	-	-	-	-	-	-	-	-	-	-	0	-	-	0	-	3	-	-	0	3
25	-	1	-	-	-	-	-	-	1	-	0	-	-	0	-	1	-	-	1	2
26	-	-	-	1	-	-	-	-	0	-	0	1	-	0	-	1	-	-	0	3
27	-	-	-	-	1	-	-	-	1	-	1	-	-	1	-	0	1	-	4	1
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	1	2
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																			8	15

Appendix 2c. Age frequency data, Cruise 92-B, September 20 - October 2, 1992.

Set #	2	8	10	11	12	13	17	18	27	Total
Age										
1	-	-	-	-	-	-	-	-	-	-
2	-	-	1	-	-	1	1	2	1	6
3	1	-	0	0	1	2	0	1	0	5
4	-	1	1	1	1	-	1	2	0	7
5	-	-	-	-	0	-	-	2	1	3
6	-	-	-	-	0	-	-	0	-	0
7	-	-	-	-	1	-	-	0	-	1
8	-	-	-	-	-	-	-	1	-	1
Total										23

Appendix 2d. Maturity - frequence data, Cruise 92-B, September 20 - October 2, 1992.

Set	2	8	10	11	12	13	17	18	27	Total
Maturity										
12	1	1	2	1	3	3	2	8	2	23

Appendix 3. Cruise 93-A, west coast of Vancouver Island, La Perouse, August 4 – 12, 1993. Data is presented for sets with sardine catch only.[a]

Set Number	4	5	11	12	14	18
Area	La Perouse	La Perouse	La Perouse	La Perouse	La Perouse	La Perouse
Date	08/05/93	08/05/93	08/07/93	08/08/93	08/09/93	08/10/93
Depth (m)	130	200	115	70	105	129
Latitude	48.41	48.25	48.89	48.47	48.55	48.76
Longitude	-125.02	-125.77	-126.24	-125.61	-125.57	-126.16
Effort (hr)	0.27	0.15	0.57	0.48	0.58	0.77
Net headrope temp (°C)	-	-	-	-	-	-
Sardine catch (kg)	1	1	617	1	0	1
Sardine catch per hour (kg/hr)	3.75	6.67	1068.82	2.07	0.00	1.30
PACIFIC SARDINE (kg)	1	1	617	1	0	1
SPINY DOGFISH (kg)	212	-	-	74	168	10
PACIFIC HAKE (kg)	2544	1938	1083	-	-	1933
CHINOOK SALMON(kg)	-	-	-	8	13	4
PACIFIC HERRING (kg)	1	-	445	28	179	4
PACIFIC MACKEREL (kg)	76	4	22	62	11	55
JACK MACKEREL (kg)	-	-	-	40	6	1
AMERICAN SHAD (kg)	1	-	trace	1	-	-
LINGCOD (kg)	-	-	trace	-	-	-
YELLOWTAIL ROCKFISH (kg)	-	-	1083	-	1	106
WIDOW ROCKFISH (kg)	-	1	-	1	-	-
REDSTRIPE ROCKFISH (kg)	-	-	-	1	-	-
PACIFIC OCEAN PERCH (kg)	-	3	-	-	-	-

[a]From August 4 to 12, 1993, total of 23 sets were completed in the La Perouse area, from 48.95°N, 126.38°W to 48.25°N, 125.77°W, using a midwater rope trawl. All sets were deeper than 45m. However, sardines were captured in 6 sets, and were likely caught as the net was retrieved (Appendix 3a). Other species captured along with sardines included Pacific hake, Pacific herring, Pacific mackerel, yellowtail rockfish, and spiny dogfish.

Appendix 3a. Cruise 93-A, August 4 – 12, 1993. All sets deeper than 45 m. Numbered dots represent sets in which sardines were captured.

Appendix 3b. Length frequency data, Cruise 93-A, La Perouse, August 4 - 12, 1993.

set #	4		5		11		Total	
Length (cm)	M	F	M	F	M	F	M	F
5	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-
23	-	-	-	-	2	2	2	2
24	-	1	1	-	12	9	13	10
25	-	0	0	1	27	13	27	14
26	-	1	0	0	21	21	21	22
27	-	1	0	0	20	15	20	16
28	1	1	0	0	19	20	20	21
29	-	1	0	1	1	2	1	4
30	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-
Total							104	89

Appendix 3c. Maturity data, Cruise 93-A, La Perouse, August 4 - 12, 1993

Set #	4		5		Total	
	M	F	M	F	M	F
Maturity						
3	1	3	0	2	1	5
12	0	1	1	0	1	1
Total					2	6

Appendix 4. Set data, Cruise 95-A, La Perouse, August 1 – 7, 1995. Data is presented for sets with sardine catch only.[a]

Set Number	11	9
Area	La Perouse	La Perouse
Date	05/08/95	04/08/95
Depth (m)	66	surface
Latitude	48.76	48.525
Longitude	-125.83	-125.56
Effort (hr)	0.23	0.18
Net headrope temp (°C)	13.10	13.5
Sardine catch (kg)	0.40	0
Sardine catch per hour (kg/hr)	1.71	0
PACIFIC SARDINE (kg)	0.40	-
PACIFIC HERRING (kg)	132	-
CHINOOK SALMON (kg)	13	-

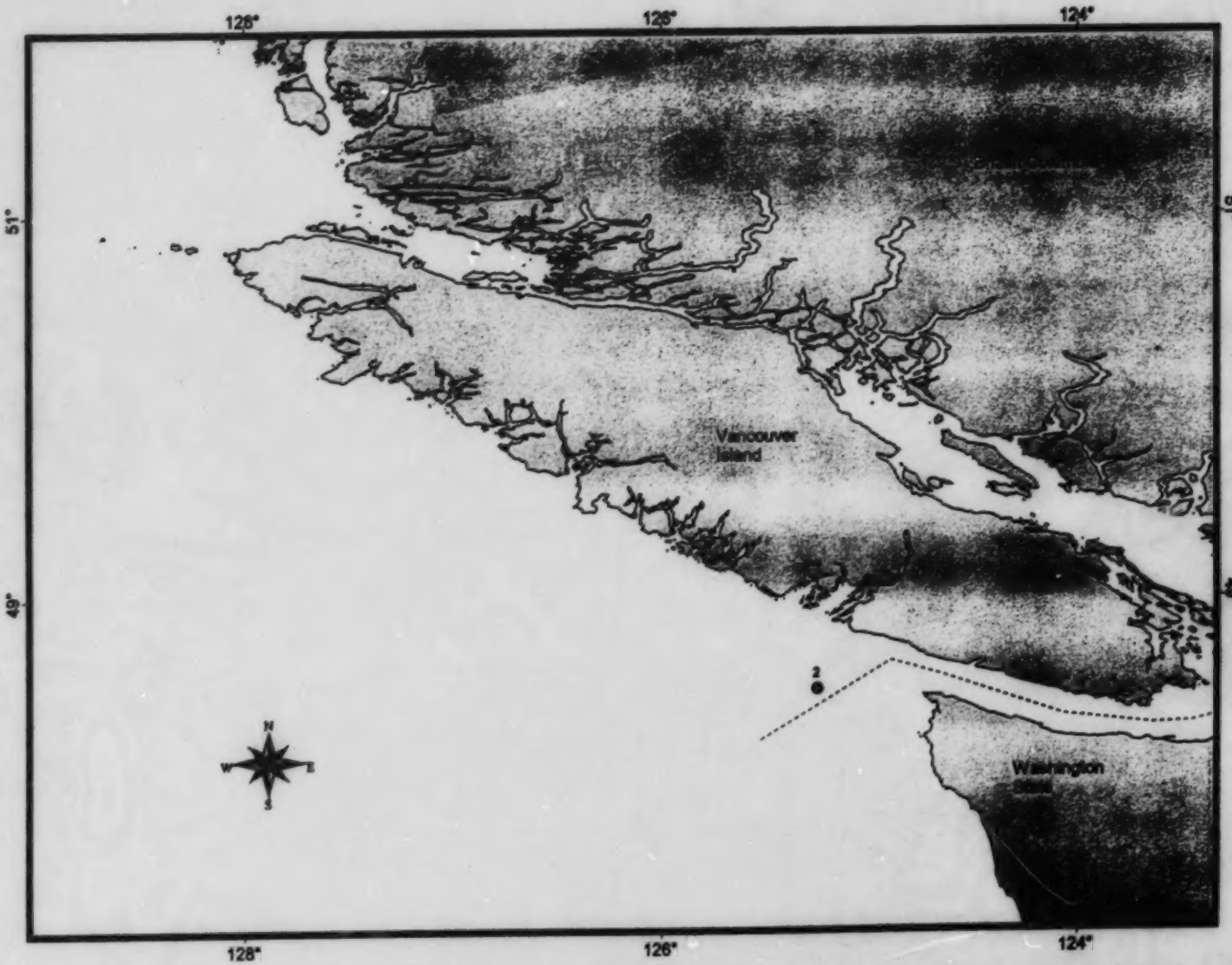
[a]From August 1 to 5, 1995, a total of 22 sets were completed in the La Perouse area, from 48.89°N, 126.60°W to 48.37°N, 125.68°W, using a midwater rope trawl. One set was made in surface waters (≤ 45m). However, sardines were captured in set 11, which was set at 66m, and were likely captured as the net was retrieved (Appendix 4a). Pacific herring and chinook salmon were also captured in set 11.

Appendix 4a. Cruise 95-A, August 1, 1995. X's represent sets at depths of 45 m or shallower in which sardines were not captured. Numbered dots represent sets in which sardines were captured.

Appendix 5. Set data, Cruise 96-A, La Perouse, July 30 – August 5, 1996. Data is presented for sets with sardine catch only.[a]

Set Number	2
Area	La Perouse
Date	07/30/96
Depth (m)	138
Latitude	48.42
Longitude	-125.30
Effort (hr)	1.07
Net headrope temp (°C)	11.40
Sardine catch (kg)	0.17
Sardine catch per hour (kg/hr)	0.15
PACIFIC SARDINE (kg)	0.17
PACIFIC HAKE (kg)	373.2
SPINY DOGFISH (kg)	155.9
EULACHON (kg)	trace
PACIFIC LAMPREY (kg)	trace

From July 30 to August 5, 1996, a total of 18 sets were completed in the La Perouse area, from 48.87°N, 125.57°W to 48.29°N, 125.69°W, using a midwater rope trawl. All sets were deeper than 45m. However, sardines were captured in set 2, which had a target depth of 138m. Sardines were likely captured as the net was retrieved (Appendix 5a). Pacific hake and spiny dogfish were also captured in set 2.



Appendix 5a. Cruise 96-A, July 30 – August 5, 1996. All sets deeper than 45 m. Numbered dots represent sets in which sardines were captured.

Appendix 6. Set data, Cruise 97-A, west coast of Vancouver Island, April 4 – 22, 1997. Data is presented for sets with sardine catch only.[a]

Set Number	20	57	58	59
Area	Swiftsure	JDF	JDF	JDF
Date	04/10/97	04/15/97	04/16/97	04/16/97
Depth (m)	0-15	0-15	0-15	0-15
Latitude	48.60	48.33	48.38	48.42
Longitude	-124.86	-124.39	-124.54	-124.70
Effort (hr)	0.7	0.97	1	0.83
Net headrope temp (°C)	8.3	-	-	-
Sardine catch (kg)	0.17	0.17	0.33	0.17
Sardine catch per hour (kg/hr)	0.24	0.17	0.33	0.20
PACIFIC SARDINE (#)	1	1	2	1
PACIFIC HERRING (#)	2	-	-	-
COHO SALMON (#)	14	-	-	-
CHINOOK SALMON (#)	79	-	-	-
SOCKEYE SALMON (#)	-	-	-	-
SQUID (#)	-	-	-	-
CALIFORNIA HEADLIGHTFISH (#)	-	-	-	-
PACIFIC LAMPREY (#)	-	-	-	-
PACIFIC HAKE (#)	-	-	-	-
MYCTOPHID (#)	-	-	-	-

Appendix 6 (cont'd)

Set Number	61	83	95
Area	Washington	WCVI South	Nootka
Date	04/16/97	04/19/97	04/20/97
Depth (m)	0-15	0-15	280
Latitude	48.34	48.92	49.28
Longitude	-124.94	-126.01	-127.27
Effort (hr)	1	1	0.5
Net headrope temp (°C)	-	9.3	5.3
Sardine catch (kg)	0.17	0.17	1.32
Sardine catch per hour (kg/hr)	0.17	0.17	2.64
PACIFIC SARDINE (#)	1	1	8
PACIFIC HERRING (#)	-	2	12
COHO SALMON (#)	-	-	-
CHINOOK SALMON (#)	-	9	-
SOCKEYE SALMON (#)	-	13	-
SQUID (#)	-	20	1
CALIFORNIA HEADLIGHTFISH (#)	-	-	15
PACIFIC LAMPREY (#)	-	-	1
PACIFIC HAKE (#)	-	-	94
MYCTOPHID (#)	-	-	19

[a]From April 10 – 21, 1997, a total of 100 sets were completed on the west coast of Vancouver Island, from 50.70°N, 128.62°W to 47.34°N, 124.61°W, using a midwater rope trawl. A total of 70 sets were made in surface waters (≤ 45m). Sardines were captured in 7 sets; 6 were surface sets, one (set 95) had a target depth of 280m (Appendix 6a). Chinook and sockeye salmon were also captured in the surface sets, while myctophids and Pacific hake were captured in set 95.

Appendix 6a. Cruise 97-A, April 10 – 27, 1997. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 6b. Length frequency data, Cruise 97-A, April 10 - 21, 1997.

Set #	20	57	58	59	61	83	al
Length (cm)							
5	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-
24	-	-	-	1	-	-	1
25	-	-	-	-	-	-	0
26	-	-	1	-	-	-	1
27	-	-	0	-	-	1	1
28	-	1	1	-	1	-	3
29	1	-	-	-	-	-	1
30	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-
Total							7

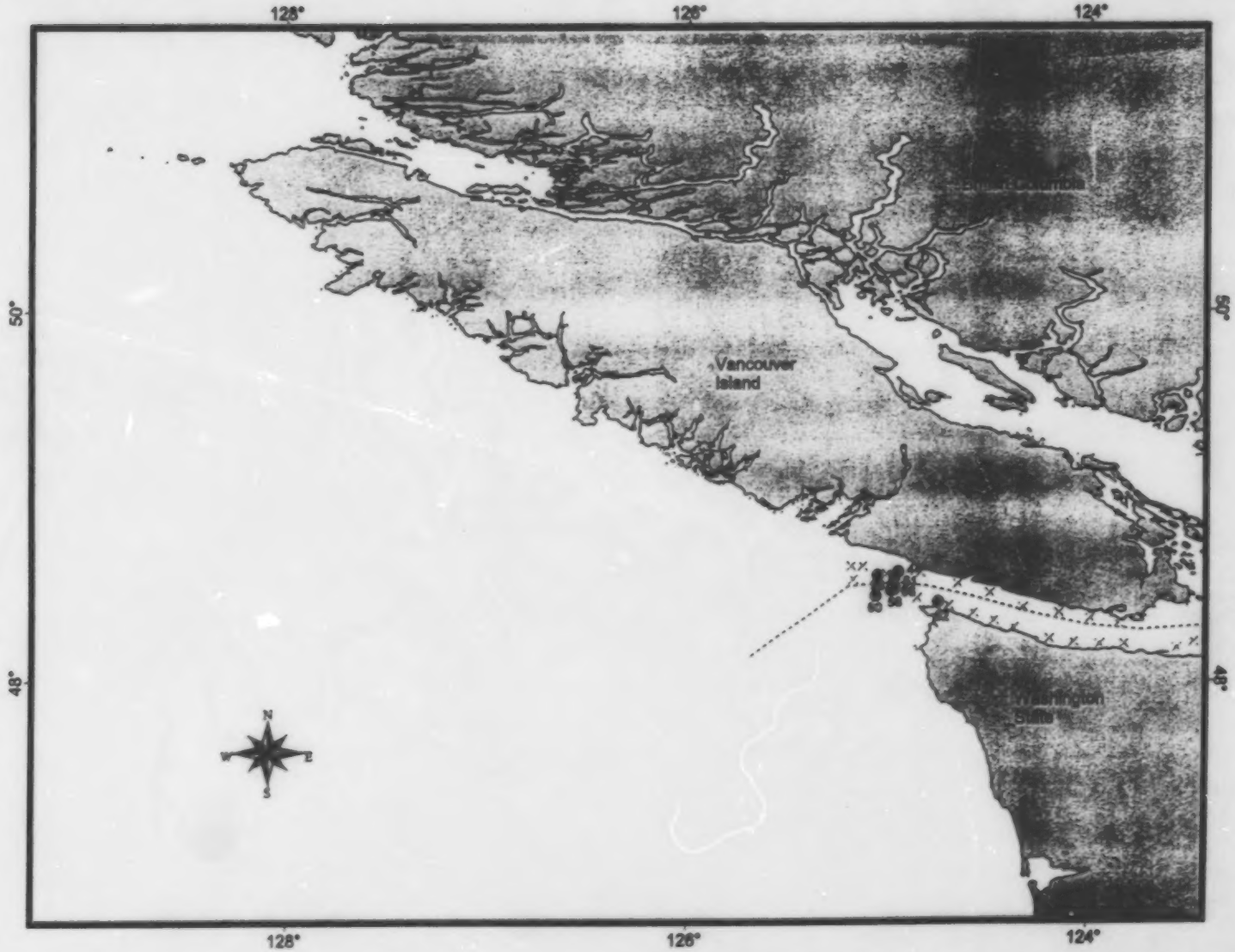
Appendix 7. Set data, Cruise 97-B, west coast of Vancouver Island, May 27 – June 7, 1997. Data is presented for sets with sardine catch only.

Set Number	44	49	51	52
Area	Swiftsure	Swiftsure	Swiftsure	Swiftsure
Date	06/01/97	06/03/97	06/03/97	06/04/97
Depth (m)	0-15	0-15	0-15	0-15
Latitude	48.58	48.56	48.55	48.42
Longitude	-124.85	-124.96	-124.87	-124.64
Effort (hr)	0.50	0.25	0.50	0.50
Net headrope temp (°C)	13.9	13.9	14.2	-
Sardine catch (kg)	138.6	0.33	0.165	0.33
Sardine catch per hour (kg/hr)	277.2	1.32	0.33	0.66
PACIFIC SARDINE (#)	840	2	1	2
COHO SALMON (#)	40	26	88	-
CHINOOK SALMON (#)	14	5	13	-
CHUM SALMON (#)	-	-	3	-
SOCKEYE SALMON (#)	-	-	1	-
PACIFIC MACKEREL (#)	7	352	4	-
PACIFIC LAMPREY (#)	1	-	-	-
SPINY DOGFISH (#)	1	-	-	-
YELLOWTAIL ROCKFISH (#)	-	1	-	-

Appendix 7 (cont'd)

Set Number	56	58	59	60
Area	Swiftsure	Swiftsure	Swiftsure	Swiftsure
Date	06/04/97	06/04/97	06/04/97	06/04/97
Depth (m)	0-15	15-30	0-15	30-45
Latitude	48.50	48.48	48.51	48.45
Longitude	-124.87	-124.89	-124.88	-124.97
Effort (hr)	0.25	1.02	1.00	0.75
Net headrope temp (°C)	-	-	14.5	-
Sardine catch (kg)	0.33	6.765	0.33	1.98
Sardine catch per hour (kg/hr)	1.32	6.65	0.33	2.64
PACIFIC SARDINE (#)	2	41	2	12
COHO SALMON (#)	-	-	26	-
CHINOOK SALMON (#)	-	-	3	-
CHUM SALMON (#)	-	-	-	-
SOCKEYE SALMON (#)	-	-	1	-
PACIFIC MACKEREL (#)	-	-	22	-
PACIFIC LAMPREY (#)	-	-	-	-
SPINY DOGFISH (#)	-	-	122	-
YELLOWTAIL ROCKFISH (#)	-	-	-	-

[a]From May 27 – June 4, 1997 a total of 38 sets were completed off the west coast of Vancouver Island, from 48.61°N, 125.10°W to 48.17°N, 123.36°W, using a midwater rope trawl. A total of 34 sets were made in surface waters (≤ 45m), 8 of which contained sardines (Appendix 7a). Other species captured with sardines included coho and chinook salmon, Pacific mackerel and spiny dogfish.



Appendix 7a. Cruise 97-B, May 27 – June 7, 1997. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 7b. Length frequency data, Cruise 97-B, June 1 - 7, 1997.

	44			49			51			52			56			58			59			60			Total		
Set#	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	MALE	FEMALE	UNK
Length (cm)																											
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	0	0	2
18	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	1	1	5
19	0	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	0	0	8
20	0	0	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	0	0	10
21	3	0	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	3	0	21
22	14	16	112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	1	14	16	117
23	30	18	107	-	-	-	-	-	-	-	-	1	-	-	-	-	-	10	-	-	1	-	-	3	30	18	122
24	4	6	32	-	-	-	-	-	-	-	-	0	-	-	-	-	-	3	-	-	0	-	-	4	4	6	39
25	0	3	4	-	-	-	-	-	-	-	-	0	-	-	1	-	-	2	-	-	1	-	-	2	0	3	10
26	1	0	1	-	-	2	-	-	-	-	-	0	-	-	0	-	-	-	-	-	-	-	-	2	1	0	5
27	1	0	-	-	-	-	-	-	1	-	-	0	-	-	1	-	-	-	-	-	-	-	-	-	1	0	2
28	0	0	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
29	1	0	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
30	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
31	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
32	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																									55	45	342

Appendix 7c. Maturity - frequency data, Cruise 97-B, Jun 1 - 7, 1997.

	14	
Set #	M	F
Maturity		
Immature	2	-
Mature	26	20
Very Mature	2	2
Total	30	22

Appendix 8. Set data, Cruise 97-C, west coast of Vancouver Island and Queen Charlotte Sound, June 17 – July 11, 1997. Data is presented for sets with sardine catch only.[a]

Set Number	44	49	50	53	56	58
Area	QCS	QCS	QCS	QCS	Offshelf	Offshelf
Date	06/23/97	06/24/97	06/24/97	06/24/97	06/25/97	06/25/97
Depth (m)	0-15	0-15	0-15	0-15	0-15	15-30
Latitude	51.12	-	50.89	51.02	50.41	50.39
Longitude	-128.07	-	-128.71	-129.15	-128.14	-128.43
Effort (hr)	1	1	1	1	1	1
Net headrope temp (°C)	11.2	10.9	10.5	11.8	13.2	10.5
Sardine catch (kg)	0.33	0.165	28.05	1.815	3780	7.755
Sardine catch per hour (kg/hr)	0.33	0.165	28.05	1.815	3780	7.755
PACIFIC SARDINE (#)	2	1	170	11	16400	47
COHO SALMON (#)	26	1	2	1	-	-
CHINOOK SALMON (#)	-	-	-	-	-	-
CHUM SALMON (#)	41	3	-	25	-	-
PINK SALMON (#)	20	2	-	3	-	-
SOCKEYE SALMON (#)	149	3	-	2	-	-
PACIFIC MACKEREL (#)	-	-	-	-	-	-
JACK MACKEREL (#)	-	-	-	-	-	8
SPINY DOGFISH (#)	-	-	-	-	-	-
PACIFIC HERRING (#)	-	12	19	-	-	-
PACIFIC SANDLANCE (#)	-	-	1	1	-	-
WOLF EEL (#)	-	-	-	-	-	-
BLACK ROCKFISH (#)	3	-	-	1	-	-

Appendix 8 (cont'd)

Set Number	60	62	63	64	65	67
Area	Offshelf	Esperanza	Esperanza	Esperanza	Esperanza	Kyuquot
Date	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97
Depth (m)	0-15	0-15	0-15	15-30	30-45	0-15
Latitude	50.33	49.76	49.72	49.70	49.68	49.64
Longitude	-128.31	-127.08	-127.14	-127.23	-127.33	-127.57
Effort (hr)	1	0.5	0.5	0.5	0.5	1
Net headrope temp (°C)	11.7	12.8	13.3	9.7	9.7	13.4
Sardine catch (kg)	217	0.33	10.1	521.235	1.98	0.165
Sardine catch per hour (kg/hr)	217	0.66	20.1	1042.47	3.96	0.165
PACIFIC SARDINE (#)	1100	2	61	3159	12	1
COHO SALMON (#)	1	36	59	-	-	1
CHINOOK SALMON (#)	-	11	5	-	-	-
CHUM SALMON (#)	1	5	1	-	-	-
PINK SALMON (#)	-	-	1	-	-	2
SOCKEYE SALMON (#)	-	4	2	-	-	-
PACIFIC MACKEREL (#)	-	-	132	46	-	1
JACK MACKEREL (#)	4100	-	-	-	-	-
SPINY DOGFISH (#)	-	6	22	-	-	-
PACIFIC HERRING (#)	-	1	-	1	-	-
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
WOLF EEL (#)	-	-	-	-	-	-
BLACK ROCKFISH (#)	1	-	-	-	-	-

Appendix 8 (cont'd)

Set Number	68	70	71	72	73	75
Area	Offshelf	Nootka	Clayoquot	Clayoquot	Clayoquot	Clayoquot
Date	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97
Depth (m)	15-30	0-15	0-15	0-15	15-30	0-15
Latitude	49.59	49.54	49.30	49.27	49.25	49.24
Longitude	-127.57	-127.35	-126.34	-126.44	-126.56	-126.70
Effort (hr)	1	0.6	0.5	0.25	0.5	1
Net headrope temp (°C)	12.3	13.7	13.6	13.6	12.9	13.8
Sardine catch (kg)	0.165	0.165	4900	11500	0.02	2275
Sardine catch per hour (kg/hr)	0.165	0.275	9800	46000	0.04	2275
PACIFIC SARDINE (#)	1	1	28500	69697	1	13788
COHO SALMON (#)	-	-	2	<6*	1	1**
CHINOOK SALMON (#)	-	-	2	-	-	-
CHUM SALMON (#)	-	-	-	-	-	-
PINK SALMON (#)	-	-	3	-	-	-
SOCKEYE SALMON (#)	-	-	2	-	1	-
PACIFIC MACKEREL (#)	-	-	4	few	-	few**
JACK MACKEREL (#)	-	-	-	-	-	-
SPINY DOGFISH (#)	-	-	-	-	-	-
PACIFIC HERRING (#)	-	-	-	-	-	-
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
WOLF EEL (#)	-	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	-	-	-	-

*Catch spilled over ramp; few adult salmon present.
**Catch spilled over ramp; one salmon and one Pacific mackerel observed.

Appendix 8 (cont'd)

Set Number	77	78	79	80	81	82
Area	Clayoquot	La Perouse	La Perouse	La Perouse	La Perouse	La Perouse
Date	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97
Depth (m)	15-30	0-15	0-15	15-30	0-15	15-30
Latitude	49.15	48.93	48.93	48.89	48.86	48.81
Longitude	-126.50	-125.62	-125.71	-125.80	-125.89	-125.98
Effort (hr)	1	0.5	0.5	0.5	0.5	1
Net headrope temp (°C)	10.4	13.1	14.3	11.6	13.8	11.6
Sardine catch (kg)	8.60	1.00	737.70	0.17	781.10	11.10
Sardine catch per hour (kg/hr)	8.60	2.00	1475.40	0.33	1562.20	11.10
PACIFIC SARDINE (#)	52	6	4471	1	4734	67
COHO SALMON (#)	-	1	1	-	-	-
CHINOOK SALMON (#)	-	5	-	-	-	-
CHUM SALMON (#)	-	-	-	-	2	-
PINK SALMON (#)	-	-	-	-	-	-
SOCKEYE SALMON (#)	-	12	-	-	-	-
PACIFIC MACKEREL (#)	-	1	3	-	38	-
JACK MACKEREL (#)	-	-	-	-	-	-
SPINY DOGFISH (#)	-	-	-	-	-	-
PACIFIC HERRING (#)	-	-	-	-	-	8
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
WOLF EEL (#)	1	-	-	-	-	-
BLACK ROCKFISH (#)	-	2	-	-	-	1

Appendix 8 (cont'd)

Set Number	84	86	87	88	98	99
Area	La Perouse	La Perouse	La Perouse	-	Swiftsure	Swiftsure
Date	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97	06/25/97
Depth (m)	0-15	15-30	0-15	0-15	0-15	0-15
Latitude	48.72	48.62	48.57	48.54	48.59	48.60
Longitude	-126.15	-126.30	-126.36	-124.61	-124.88	-125.00
Effort (hr)	1	0.5	1	0.5	0.5	0.5
Net headrope temp (°C)	-	5.9	-	-	6.2	9.3
Sardine catch (kg)	80.2	2.145	0.99	0.33	4.29	1522
Sardine catch per hour (kg/hr)	80.2	4.29	0.99	0.66	8.58	3044
PACIFIC SARDINE (#)	486	13	6	2	26	10146
COHO SALMON (#)	-	-	-	72	27	113
CHINOOK SALMON (#)	-	-	-	7	5	4
CHUM SALMON (#)	-	-	-	-	-	-
PINK SALMON (#)	-	-	-	2	-	4
SOCKEYE SALMON (#)	-	-	-	-	3	1
PACIFIC MACKEREL (#)	-	12	-	-	4	450
JACK MACKEREL (#)	-	-	-	2	-	32
SPINY DOGFISH (#)	-	-	-	53	-	34
PACIFIC HERRING (#)	-	-	-	-	4	-
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
WOLF EEL (#)	-	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	-	-	-	-

Appendix 8 (cont'd)

Set Number	103	104	106	110	115	116
Area	La Perouse	La Perouse	La Perouse	Columbia	Columbia	Columbia
Date	06/25/97	06/25/97	06/25/97	07/02/97	07/02/97	7/3/97
Depth (m)	0-15	15-30	0-15	0-15	0-15	0-15
Latitude	48.58	48.53	48.40	46.46	46.66	47.12
Longitude	-125.51	-125.56	-125.54	-124.21	-124.62	-124.39
Effort (hr)	0.5	0.5	0.5	0.35	0.5	0.5
Net headrope temp (°C)	11.5	9.9	13.8	-	-	-
Sardine catch (kg)	495	10.395	1520.64	1469	973.5	2780
Sardine catch per hour (kg/hr)	990	20.79	3041.28	4197.14	1947	5560
PACIFIC SARDINE (#)	3000	63	9216	2240	5900	21400
COHO SALMON (#)	3	-	4	-	-	-
CHINOOK SALMON (#)	2	-	2	-	-	-
CHUM SALMON (#)	-	-	-	-	-	-
PINK SALMON (#)	1	-	-	-	-	-
SOCKEYE SALMON (#)	-	-	-	-	-	-
PACIFIC MACKEREL (#)	45	1	1080	-	-	-
JACK MACKEREL (#)	19	-	19	-	-	-
SPINY DOGFISH (#)	5	11	-	-	-	-
PACIFIC HERRING (#)	-	-	-	-	-	-
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
WOLF EEL (#)	-	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	-	-	-	-

Appendix 8 (cont'd)

Set Number	117	119	122	124	131
Area	Columbia	Columbia	Columbia	Cape Beale	Cape Beale
Date	7/3/97	7/3/97	7/3/97	7/4/97	7/4/97
Depth (m)	15-30	15-30	0-15	0-15	>45
Latitude	47.11	47.09	47.09	48.43	48.45
Longitude	-124.49	-124.66	-125.04	-125.16	-124.87
Effort (hr)	0.5	0.5	0.5	0.4	0.5
Net headrope temp (°C)	-	-	-	-	-
Sardine catch (kg)	206.25	4091	28.215	1470	1.815
Sardine catch per hour (kg/hr)	412.5	8182	56.43	3527.72	3.63
PACIFIC SARDINE (#)	1250	24793	171	10200	11
COHO SALMON (#)	-	-	-	-	-
CHINOOK SALMON (#)	-	-	-	-	-
CHUM SALMON (#)	-	-	-	-	-
PINK SALMON (#)	-	-	-	-	-
SOCKEYE SALMON (#)	-	-	-	-	-
PACIFIC MACKEREL (#)	-	-	-	-	-
JACK MACKEREL (#)	-	-	-	-	-
SPINY DOGFISH (#)	-	-	-	-	-
PACIFIC HERRING (#)	-	-	-	-	-
PACIFIC SANDLANCE (#)	-	-	-	-	-
WOLF EEL (#)	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	-	-	-

[a]From June 17 – July 11, 1997, a total of 103 sets were completed off the west coast of Vancouver Island, in Queen Charlotte Sound, Juan de Fuca Strait, and off the coast of the Columbia region of Washington, from 51.20°N, 128.33°W to 46.39°N, 124.27°W, using a surface rope trawl. A total of 89 sets were made in surface waters (≤ 45m). Sardines were captured in 41 sets, one of which was deeper than 45m (Fig. 1). Species captured along with sardines included coho, sockeye and chum salmon, Pacific mackerel and jack mackerel.

Appendix 8a. Cruise 97-C, June 23 – July 5, 1997. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 8b. Length frequency data, Cruise 97-C, June 23 - July 5, 1999.

	44			49			50			53			54			56			58			60		
Set #	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U
Length (cm)																								
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
16	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-
17	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	3	1	0	-	-	-
18	-	-	-	-	-	-	-	-	0	1	-	-	-	-	-	-	-	-	2	4	1	-	-	-
19	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	1	2	0	-	-	-
20	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	0	4	0	-	-	-
21	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	1	1	0	2	-	-
22	-	-	1	-	-	-	-	-	0	0	-	-	-	-	-	-	2	-	10	3	0	0	-	-
23	-	-	0	-	-	-	5	2	4	0	-	-	-	-	-	7	6	-	3	0	0	0	-	4
24	-	-	0	-	-	-	16	18	30	1	1	-	-	-	-	15	13	-	6	2	0	2	5	28
25	-	-	0	-	-	-	10	17	43	2	1	-	-	-	1	20	8	-	7	9	1	5	6	52
26	-	-	1	-	1	-	8	7	21	0	4	-	-	-	-	5	2	-	2	7	0	9	6	44
27	-	-	-	-	-	-	-	4	10	1	-	-	-	-	-	2	4	-	6	2	0	3	6	30
28	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	0	-	3	2	1	2	2	9
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	1	0	-	-	2	1
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	1	-	-	-	2
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	1
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-

Appendix 8b (cont'd)

Set #	62			63			64			67			70			71			72			73		
Length (cm)	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
21	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-
22	-	-	-	-	2	-	-	-	6	-	-	-	-	-	-	-	-	4	-	0	-	-	-	-
23	-	-	-	1	7	4	6	4	33	-	-	1	-	-	-	6	3	66	9	3	-	-	-	-
24	-	-	1	6	1	14	10	9	87	-	-	-	-	-	1	15	13	100	15	11	-	-	-	1
25	-	-	0	3	0	18	8	8	41	-	-	-	-	-	-	7	4	27	3	6	-	-	-	-
26	-	-	1	0	1	3	1	0	13	-	-	-	-	-	-	-	1	11	1	-	-	-	-	-
27	-	-	-	-	-	1	1	2	1	-	-	-	-	-	-	-	0	1	-	-	-	-	-	-
28	-	-	-	-	-	0	-	1	0	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
29	-	-	-	-	-	0	-	-	1	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
30	-	-	-	-	-	0	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
31	-	-	-	-	-	0	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
32	-	-	-	-	-	0	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
33	-	-	-	-	-	1	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix 8 (cont'd)

	75			78			79			81			84			98			99			102		
Set #	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U
Length (cm)																								
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
21	3	-	-	-	-	-	-	-	-	1	-	-	-	-	0	-	-	-	-	-	-	-	-	-
22	12	2	4	-	-	-	1		17	2	-	-	2	1	9	-	-	2	-	-	2	-	-	10
23	8	12	53	-	-	3	6	5	54	9	9	-	5	9	59	-	-	5	-	-	26	6	4	52
24	9	29	94	-	-	3	14	9	82	9	10	-	10	16	55	-	-	12	-	-	36	2	4	48
25	8	12	46	-	-	-	2	10	31	0	8	-	1	1	17	-	-	4	-	-	25	0	1	16
26	-	2	2	-	-	-	-	3	8	0	-	-	1	1	2	-	-	2	-	-	6	0	1	6
27	-	2	0	-	-	-	-	-	5	1	-	-	0	1	4	-	-	0	-	-	4	0	-	1
28	-	1	0	-	-	-	-	-	3	0	-	-	1	0	1	-	-	0	-	-	0	1	-	1
29	-	-	1	-	-	-	-	-	-	0	-	-	-	0	0	-	-	1	-	-	1	-	-	-
30	-	-	-	-	-	-	-	-	-	0	-	-	-	0	1	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	0	-	-	-	1	0	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	0	-	-	-	-	2	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix 8 (cont'd)

	109			110			116			124			137			TOTAL		
Set #	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	MALE	FEMALE	UNK
Length (cm)																		
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	0	0	1
15	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	0	2
16	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	0	0
17	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	3	3	3
18	-	-	-	1	0	1	-	-	-	-	-	-	-	-	-	4	4	3
19	-	-	-	2	1	7	-	-	-	-	-	-	-	-	-	3	3	7
20	-	-	-	4	3	59	-	-	2	-	-	-	-	-	-	4	8	61
21	-	-	2	12	7	75	-	-	20	-	-	-	-	-	-	19	8	98
22	-	-	6	9	16	35	-	4	107	-	-	8	-	-	-	36	30	211
23	-	-	3	1	7	7	2	4	124	-	-	39	-	-	-	74	75	537
24	-	-	1	1	3	1	4	6	52	-	-	29	-	-	1	135	150	676
25	-	-	-	-	-	-	-	-	8	-	-	19	-	-	-	76	91	349
26	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	27	36	123
27	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	14	21	59
28	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	7	7	22
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	5
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	3
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	3
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	3
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0
Total																404	441	2167

Appendix 8c. Maturity - frequency data, Cruise 97-C, June 23 - July 5, 1997.

	50			56			58			75			110			Totals		
Set	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U
Maturity																		
Immature	-	-	-	3	-	-	16	9	2	-	-	-	19	13	1	38	22	3
Mature	18	31	-	16	31	-	6	5	-	-	-	-	-	16	-	40	83	-
Very mature	1	2	-	-	-	-	-	0	-	-	-	-	-	-	-	1	2	-
Ripening	-	-	-	-	-	-	-	0	-	21	29	-	-	-	-	21	29	-
Ripe	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-
Total																100	137	3

Appendix 8d. Stomach contents data, Cruise 97-C, June 25 - July 5, 1997.

Set	# of stomachs	total volume (cc)	digested material (cc)	crab zoea (cc)	crab mega (cc)	calanoid (cc)	hypurid (cc)	scales (cc)	euphausiid (cc)
50	20	13.9	13.335	0.14	0.36	0.035	0.03	-	-
56	10	7.1	5.78	0.06	0	-	-	1.26	-
58	5	3.3	3.3	-	0	-	-	0	-
75	20	13.3	9.58	-	0.16	-	-	3.32	0.24
110	5	4.8	4.26	-	-	-	-	0.54	-
TOTAL	60	42.4	36.26	0.2	0.52	0.035	0.03	10.24	0.48

Appendix 9. Set data, Cruise 97-D, La Perouse, August 4 – 9, 1997. Data is presented for sets with sardine catch only.[a]

Set Number	18	11	19	7	24
Area	La Perouse	La Perouse	La Perouse	La Perouse	La Perouse
Date	8/7/97	8/5/97	8/7/97	8/4/97	8/9/97
Depth (m)	4	surface	variable	surface	surface
Latitude	48.7	48.3	48.8	48.5	48.8
Longitude	-125.5	-125.6	-125.6	-125.5	-125.5
Effort (hr)	0.5	0.4	0.8	0.6	0.5
Net headrope temp (°C)	-	-	-	-	13.2
Sardine catch (kg)	1148.0	1191.0	18.2	1890.0	trace
Sardine catch per hour (kg/hr)	2221.9	2977.5	21.8	3335.3	trace
COHO SALMON (kg)	9	5	-	1	6.8
CHINOOK SALMON (kg)	9	35	0.5	4	8.3
CHUM SALMON (kg)	-	-	-	24	-
PINK SALMON (kg)	7	-	1.6	-	1.6
SOCKEYE SALMON (kg)	-	-	-	-	8
PACIFIC MACKEREL (kg)	18	94	2.7	87	102
JACK MACKEREL (kg)	-	4	295	840	54
SPINY DOGFISH (kg)	8	-	7.8	180	1.8
PACIFIC HERRING (kg)	-	-	203	-	-
PACIFIC HAKE (kg)	80	-	-	-	-

[a] From August 4 – 9, 1997, a total of 25 sets were completed in the La Perouse area, from 48.81°N, 125.62°W to 48.31°N, 125.61°W, using a midwater rope trawl. A total of 7 sets were made in surface waters (≤ 45m). Sardines were captured in 5 sets, one of which was listed as "variable depth" (Appendix 9a). All other sets containing sardines were made in surface waters (≤ 45m). Species captured along with sardines included Pacific mackerel, jack mackerel, spiny dogfish, Pacific herring and Pacific hake.

Appendix 9a. Cruise 97-D, August 4 – 9, 1997. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 9b. Length frequency data, Cruise 97-D, August 4 - 9, 1997.

	11			18			7			Total		
Set #	M	F	U	M	F	U	M	F	U	MALE	FEMALE	UNK
Length (cm)												
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	3	-	-	-	-	-	-	-	-	3	-	-
22	5	10	9	8	2	-	10	5	-	23	17	9
23	18	22	43	27	29	-	15	32	-	60	83	43
24	10	17	46	39	39	-	20	35	1	69	91	47
25	1	2	11	17	21	-	5	9	-	23	32	11
26	-	1	1	4	5	-	2	5	-	6	11	1
27	-	-	-	2	2	-	3	0	-	5	2	-
28	-	-	-	-	-	-	1	0	-	1	0	-
29	-	-	-	-	-	-	1	0	-	1	0	-
30	-	-	-	-	-	-	1	1	-	1	1	-
31	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
Total										192	237	111

Appendix 9c. Maturity - frequency data, Cruise 97-D, August 4 - 9, 1997.

	7		11		18		Total	
Set	M	F	M	F	M	F	M	F
Maturity								
Immature	16	28	19	31	18	20	53	79
Mature	2	4	-	1	1	11	3	16
Total							56	95

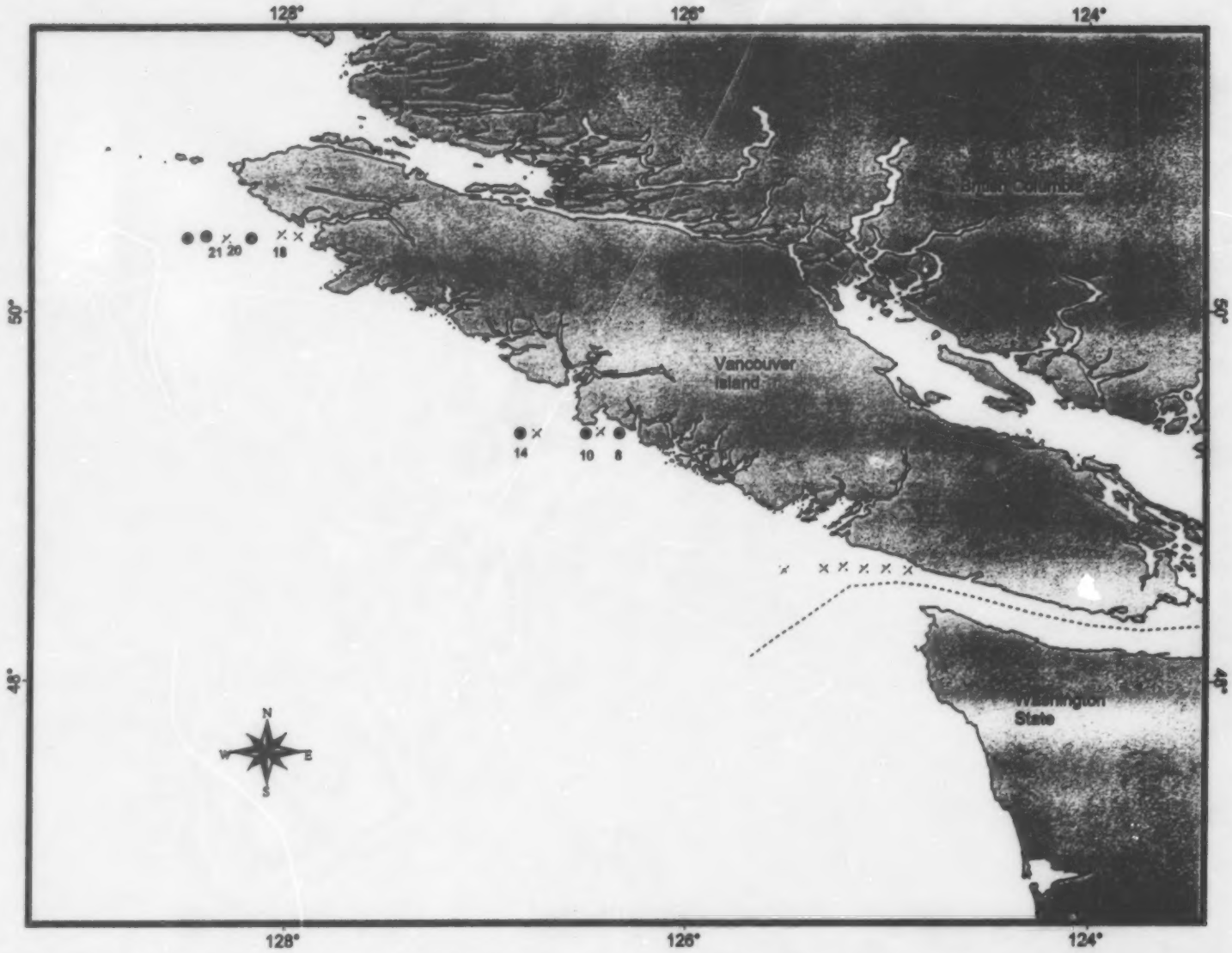
Appendix 9d. Stomach contents data, Cruise 97-D, August 4 - 9, 1997.

Set	# of stomachs	total volume (cc)	digested material (cc)	copepod eggs (cc)	sardine scales (cc)	euphausiids (cc)
7	10	16.2	10.56	-	5.64	-
11	11	8.3	4.74	1.1	1.12	1.34
18	12	11.2	8.21	-	2.99	-
Total	33	35.7	23.51	1.1	9.75	1.34

Appendix 10. Set data, Cruise 97-E, La Perouse, August 13 – 19, 1997. Data is presented for sets with sardine catch only.[a]

Set Number	8	10	14	18	20	21
Area	Nootka	Nootka	Nootka	Quatsino	Quatsino	Quatsino
Date	08/17/97	08/17/97	08/17/97	08/19/97	08/19/97	08/19/97
Depth (m)	0	0	0	0	15	0
Latitude	49.33	49.33	49.33	50.38	50.39	50.38
Longitude	-126.34	-126.52	-126.87	-128.31	-128.55	-128.65
Effort (hr)	0.48	0.10	0.63	0.77	0.47	0.48
Net headrope temp (°C)	-	-	-	-	-	-
Sardine catch (kg)	0.45	1108.6	70.6	0.165	0.165	0.165
Sardine catch per hour (kg/hr)	0.93	11086	111.47	0.22	0.35	0.34
PACIFIC SARDINE (#)	2	6718	415	1	1	1
COHO SALMON (#)	-	-	-	-	-	9
PINK SALMON (#)	-	-	-	-	-	3
SOCKEYE SALMON (#)	-	-	-	-	-	1
PACIFIC HAKE (#)	-	-	-	-	-	3
JACK MACKEREL (#)	-	-	-	-	-	58

[a]From August 13 – 19, 1997, a total of 21 sets were completed in the La Perouse area, from 50.38°N, 128.65°W to 48.59°N, 124.80°W, using a midwater rope trawl. A total of 17 sets were made in surface waters (≤ 45m). Of the surface tows, sardines were captured in 6 sets (Appendix 10a). Sardines were the exclusive catch in 5 of the 6 sets. Other species caught in set 21 included coho, pink and sockeye salmon, Pacific hake and jack mackerel.



Appendix 10a. Cruise 97-E, August 13 - 19, 1997. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 10b. Length frequency data, Cruise 97-E, August 13 - 19, 1997.

	10			14			Total		
Set #	M	F	U	M	F	U	MALE	FEMALE	UNK
Length (cm)									
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-
22	2	-	-	8	2	2	10	2	2
23	16	15	-	21	22	30	37	37	30
24	19	25	-	14	21	34	33	46	34
25	7	13	-	3	4	5	10	17	5
26	2	1	-	3	1	4	5	2	4
27	1	1	-	1	1	4	2	2	4
28	-	-	-	-	1	1	-	1	1
29	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-
Total							97	107	80

Appendix 10c. Maturity - frequency data, Cruise 97-E, August 13 - 19, 1997.

	10		14		Total	
Set	M	F	M	F	M	F
Maturity						
Very immature	1	-	-	-	1	-
Immature	6	2	19	18	25	20
Mature	1	0	4	9	5	9
Spent	-	1	-	-	-	1
Total					31	30

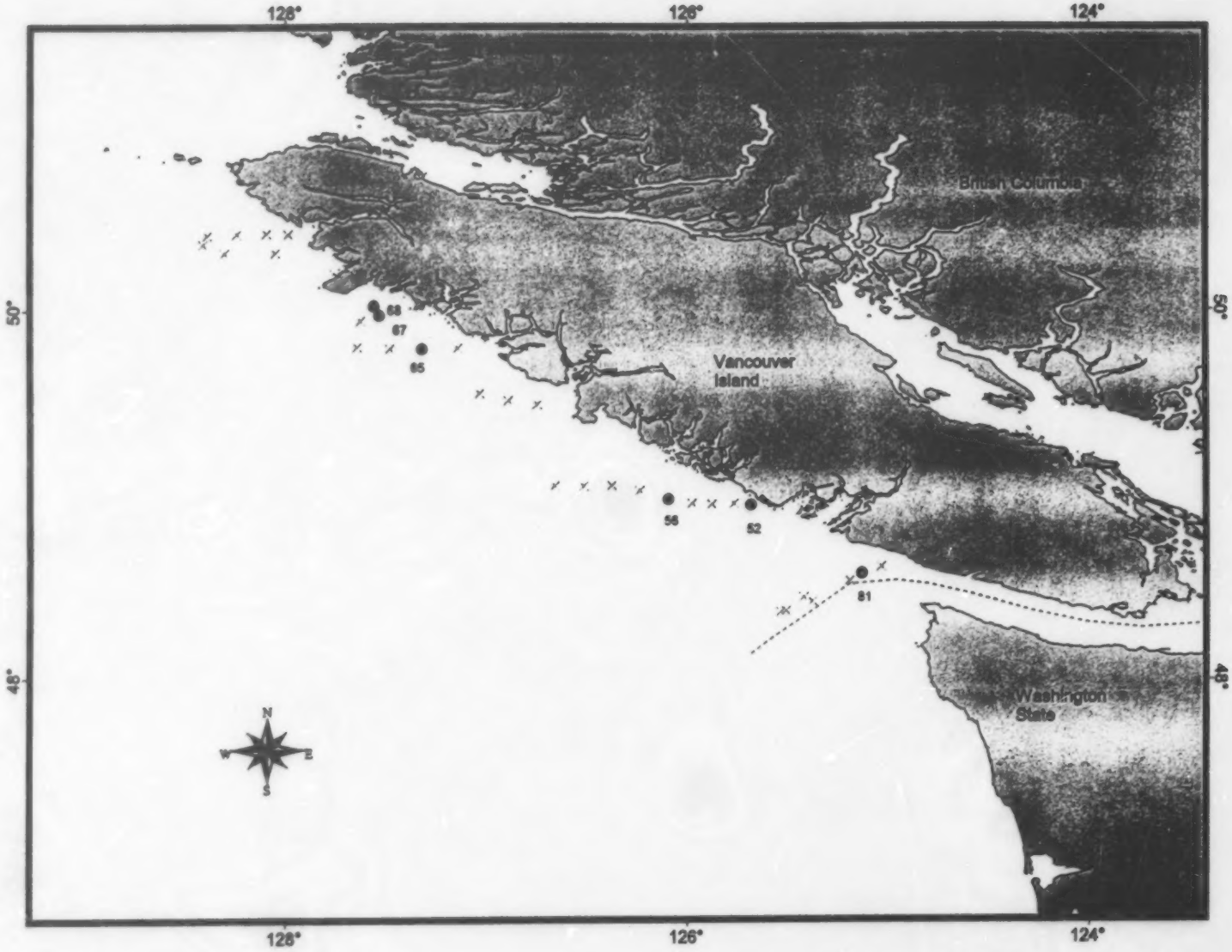
Appendix 10d. Stomach contents data, Cruise 97-E, August 13 - 19, 1997.

Set	# of stomachs	total volume (cc)	digested material (cc)	euphausiid (cc)	sardine scales (cc)
10	10	8.6	8.31	-	0.29
14	10	6.5	3.72	2.21	0.57
Total	20	15.1	12.03	2.21	0.86

Appendix 11. Set data, Cruise 97-F, west coast Vancouver Island, October 10 - 29, 1997. Data is presented for sets with sardine catch only.[a]

Set Number	52	56	62	67	68	81
Area	La Perouse	Clayoquot	Kyuquot	Kyuquot	Kyuquot	Swiftsure
Date	10/25/01	10/25/01	10/26/01	10/26/01	10/26/01	10/29/01
Depth (m)	4	15	15	15	4	15
Latitude	48.93	48.96	49.78	49.96	50.01	48.56
Longitude	-125.64	-126.08	-127.39	-127.62	-127.65	-125.05
Effort (hr)	0.5	1	1	0.5	1	0.5
Net headrope temp (°C)	14.5	14.2	14	14.2	14.2	11
Sardine catch (kg)	2842.29	0.165	0.165	0.165	1199.88	0.165
Sardine catch per hour (kg/hr)	5684.58	0.165	0.165	0.33	1199.88	0.33
PACIFIC SARDINE (#)	17226	1	1	1	7272	1
COHO SALMON (#)	47	-	1	1	12	234
CHINOOK SALMON (#)	6	-	2	-	-	133
CHUM SALMON (#)	7	1	-	-	2	14
PINK SALMON (#)	-	-	-	-	2	-
SOCKEYE SALMON (#)	-	-	-	-	-	7
PACIFIC MACKEREL (#)	-	-	-	-	271	1
JACK MACKEREL (#)	1	2	-	-	-	-
PACIFIC HERRING (#)	-	-	-	-	-	15
SABLEFISH (#)	-	-	-	-	6	-

[a]From October 10 – 29, 1997, a total of 37 sets were completed off the west coast of Vancouver Island, from 50.39°N, 128.54°W to 48.35°N, 125.48°W, using a midwater rope trawl. A total of 33 sets were made in surface waters (≤ 45m). Sardines were captured in 6 sets, all of which were made in surface waters (Appendix 11a). Species captured along with sardines included coho and chinook salmon and Pacific mackerel.



Appendix 11a. Cruise 97-F, October 10 - 29, 1997. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 11b. Length frequency data, Cruise 97-F, October 10 - 29, 1997.

	52a			52b			52			62			67			68			Total		
Set #	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	MALE	FEMALE	UNK
Length (cm)																					
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
21	4	-	-	1	2	-	-	-	11	-	-	-	-	-	-	-	-	-	5	2	11
22	16	-	-	5	17	-	-	-	57	-	-	-	-	-	-	3	3	9	24	20	66
23	24	7	-	11	40	-	-	-	85	-	-	-	-	-	-	15	11	23	50	58	108
24	9	22	-	1	13	-	-	-	85	-	-	-	-	-	1	13	26	36	23	61	122
25	-	6	-	3	-	-	-	-	19	-	-	-	-	-	-	5	14	23	8	20	42
26	-	3	-	3	-	-	-	-	4	-	-	-	-	-	-	2	4	3	5	7	7
27	-	-	-	2	-	-	-	-	1	-	-	1	-	-	-	2	0	4	4	0	6
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	1	2
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																			119	171	364

Appendix 11c. Stomach contents data, Cruise 97-F, October 10 - 29, 1997.

Set	# of stomachs	Total Volume (cc)	Digested Material (cc)	Copepod Eggs (cc)	Sardine Scales (cc)	Euphausiids (cc)
52a	10	8.1	3.26	-	4.77	0.08
52b	5	5.7	3.56	-	2.14	-
Total	15	13.8	6.82	-	6.91	0.08

Appendix 12. Set data, Cruise 98-A, west coast Vancouver Island, February 17 – March 7, 1998. Data is presented for sets with sardine catch only.[a]

Set Number	45	47	52	53	55	59
Area	Swiftsure	Swiftsure	La Perouse	La Perouse	La Perouse	Barkley Sound
Date	02/17/98	02/17/98	02/17/98	02/17/98	02/17/98	02/18/98
Depth (m)	0-15	0-15	15-30	30-45	0-15	0-15
Latitude	48.59	48.55	48.72	48.79	48.86	48.86
Longitude	-124.80	-125.00	-125.43	-125.48	-125.54	-125.24
Effort (hr)	0.5	0.5	0.5	0.5	0.5	1
Net headrope temp (°C)	8.5	9.9	10.7	10.6	10.6	-
Sardine catch (kg)	189.75	2.31	2.145	0.165	0.66	0.165
Sardine catch per hour (kg/hr)	379.5	4.62	4.29	0.33	1.32	0.165
PACIFIC SARDINE (#)	1150	14	13	1	4	1
COHO SALMON (#)	17	161	3	0	2	132
CHINOOK SALMON (#)	36	54	19	12	1	61
CHUM SALMON (#)	2	1	0	0	7	1
PACIFIC HERRING (#)	~1200	trace	-	-	-	-

Appendix 12 (cont'd)

Set Number	62	63	72	73	85	88
Area	Juan De Fuca	Juan De Fuca	Juan De Fuca	Juan De Fuca	Swiftsure	Swiftsure
Date	02/20/98	02/20/98	02/20/98	02/21/98	02/22/98	02/22/98
Depth (m)	0-15	15-30	0-15	0-15	15-30	0-15
Latitude	48.56	48.54	48.33	48.28	48.39	48.36
Longitude	-124.68	-124.58	-123.76	-124.27	-125.25	-125.46
Effort (hr)	0.5	0.5	0.58	0.5	1	1
Net headrope temp (°C)	-	-	-	-	11.8	11.5
Sardine catch (kg)	70.62	49.33	0.82	7.75	4.29	1.15
Sardine catch per hour (kg/hr)	141.24	98.67	1.41	15.51	4.29	1.15
PACIFIC SARDINE (#)	428	299	5	47	26	7
COHO SALMON (#)	6	-	1	3	-	-
CHINOOK SALMON (#)	71	131	16	31	17	-
CHUM SALMON (#)	-	-	-	-	-	-
PACIFIC HERRING (#)	-	-	-	-	-	-

Appendix 12 (cont'd)

Set Number	92	93	94	102	105	108
Area	Juan De Fuca	Juan De Fuca	Juan De Fuca	La Perouse	Clayoquot Sound	Nootka Sound
Date	02/23/98	02/23/98	02/23/98	03/04/98	03/04/98	03/05/98
Depth (m)	0-15	15-30	30-45	0-15	0-15	0-15
Latitude	48.25	48.23	48.21	48.90	48.95	49.33
Longitude	-124.18	-124.10	-124.02	-125.91	-126.36	-126.84
Effort (hr)	0.5	0.5	0.5	1	0.9	1
Net headrope temp (°C)	-	-	-	9.4	-	10.7
Sardine catch (kg)	4.62	0.165	0.165	0.165	0.33	0.165
Sardine catch per hour (kg/hr)	9.24	0.33	0.33	0.165	0.37	0.165
PACIFIC SARDINE (#)	28	1	1	1	2	1
COHO SALMON (#)	11	13	0	-	-	-
CHINOOK SALMON (#)	58	113	47	-	-	-
CHUM SALMON (#)	0	0	0	-	-	-
PACIFIC HERRING (#)	-	-	-	-	-	-

Appendix 12 (cont'd)

Set Number	110	111	112	116	123	126
Area	Nootka Sound	Nootka Sound	Nootka Sound	Washington North	La Perouse	Swiftsure
Date	03/05/98	03/05/98	03/05/98	03/06/98	03/07/98	03/07/98
Depth (m)	15-30	0-15	0-15	0-15	0-15	0-15
Latitude	49.31	49.31	49.30	48.20	48.43	48.53
Longitude	-127.18	-127.34	-127.49	-125.19	-125.68	-125.25
Effort (hr)	1.12	1	1	1	1	0.92
Net headrope temp (°C)	11	10.8	10.7	-	10	11.1
Sardine catch (kg)	0.33	5.775	1.65	0.165	0.165	0.165
Sardine catch per hour (kg/hr)	0.30	5.775	1.65	0.165	0.165	0.18
PACIFIC SARDINE (#)	2	35	10	1	1	1
COHO SALMON (#)	-	-	-	-	-	-
CHINOOK SALMON (#)	-	-	-	-	-	-
CHUM SALMON (#)	-	-	-	-	-	-
PACIFIC HERRING (#)	-	-	-	-	-	-

[a]From February 17 – March 7, 1998, a total of 85 sets were completed off the west coast of Vancouver Island, from 49.30°N, 127.49°W to 48.19°N, 123.54°W, using a midwater rope trawl. A total of 73 sets were made in surface waters (≤ 45m). Of the surface tows, sardines were captured in 24 sets (Appendix 12a). Other species included coho and chinook salmon and Pacific herring.

Appendix 12a. Cruise 98-A, February 17 – March 7, 1998. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 12b. Length - frequency data, Cruise 98-A, February 10 to March 7, 1998.

set	45	52	53	55	59	62	63	80	85	88	93	94	102	105	108	110	111	116	123	126	TOTAL
length																					
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
8	27	2	-	-	-	2	20	-	-	-	-	-	-	-	-	-	-	-	-	1	52
9	22	2	-	-	-	15	35	-	-	-	-	-	-	-	-	-	-	-	-	-	74
10	19	4	-	2	-	11	32	-	2	-	-	-	-	-	-	-	2	1	-	-	73
11	12	2	1	1	-	17	20	-	9	3	-	-	1	-	-	-	16	-	1	-	83
12	7	3	-	1	-	4	3	-	4	4	-	-	-	2	-	-	15	-	-	-	43
13	-	-	-	-	-	0	-	-	1	-	-	-	-	-	-	-	2	-	-	-	3
14	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
17	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	2
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
24	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	3
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																					349

Appendix 12c. Maturity data, Cruise 98-A, February 17 - March 7, 1998.

set	45	52	53	55	59	62	63	80	85	88	93	94	102	105	Total
Maturity															
Immature	100	13	1	4	-	50	110	-	16	-	1	1	1	2	299
Mature	-	-	-	-	1	1	-	1	-	-	-	-	-	-	3
Unknown	-	-	-	-	-	-	-	-	-	7	-	-	-	-	7
Total															309

Maturities were determined without sex determination.
Maturities were classified as either "mature", Young of Year, and "ocean age 1".

Appendix 13. Set data, Cruise 98-B, west coast Vancouver Island April 10 – 21, 1998. Data is presented for sets with sardine catch only.[a]

Set Number	42	44	46	48	51	52
Area	WCVI	WCVI	Kyuquot	Brooks Peninsula	Brooks Peninsula	Brooks Peninsula
Date	04/12/98	04/12/98	04/13/98	04/13/98	04/13/98	04/13/98
Depth (m)	4	4	15	4	4	15
Latitude	48.92	48.93	49.93	49.92	50.13	50.24
Longitude	-126.35	-126.71	-127.63	-127.98	-128.04	-128.09
Effort (hr)	1	1.38	1	1.5	1	1.2
Net headrope temp (°C)	10.7	10.5	10.5	10.2	10.6	10.3
Sardine catch (kg)	0.17	0.33	0.33	0.83	0.83	0.33
Sardine catch per hour (kg/hr)	0.17	0.24	0.33	0.55	0.83	0.28
PACIFIC SARDINE (#)	1	2	2	5	5	2
PACIFIC HERRING (#)	1	-	1	-	2	1
COHO SALMON (#)	17	-	-	-	1	-
CHINOOK SALMON (#)	22	-	4	-	31	4
CHUM SALMON (#)	1	-	-	-	-	-
PINK SALMON (#)	-	-	-	-	-	-
PACIFIC MACKEREL (#)	-	8	-	-	-	-
PACIFIC SANDLANCE (#)	-	-	64	4	-	-
PACIFIC HAKE (#)	-	-	-	-	-	-
EULACHON (#)	-	-	-	-	-	-
FLATFISH LARVAE (#)	-	-	-	60	-	30
RATFISH (#)	-	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	-	-	-	-
KELP GREENLING (#)	-	-	-	-	-	-

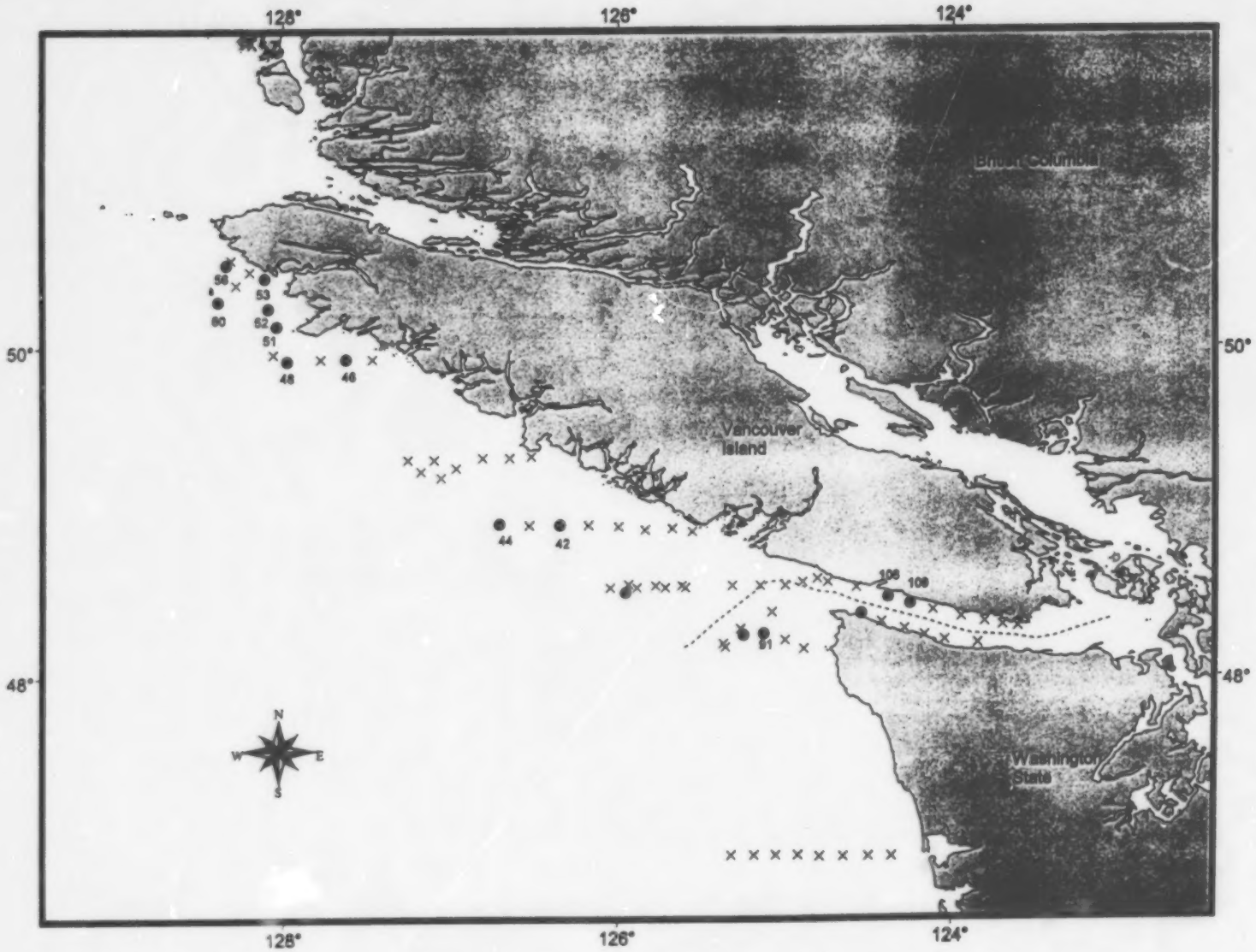
Appendix 13 (cont'd)

Set Number	53	56	57	60	79
Area	Quatsino	WCVI	Quatsino	Quatsino	Cape Beale
Date	04/14/98	04/14/98	04/14/98	04/14/98	04/16/98
Depth (m)	4	4	4	4	4
Latitude	50.42	50.50	-	50.28	48.51
Longitude	-128.11	-128.34	-	-128.39	-125.96
Effort (hr)	0.5	1.5	1.28	1.28	1
Net headrope temp (°C)	10.3	9.7	9.5	10.3	10.3
Sardine catch (kg)	0.17	0.99	0.66	2.64	0.17
Sardine catch per hour (kg/hr)	0.33	0.66	0.51	2.06	0.17
PACIFIC SARDINE (#)	1	6	4	16	1
PACIFIC HERRING (#)	-	7	-	-	1
COHO SALMON (#)	3	-	-	-	24
CHINOOK SALMON (#)	11	11	1	-	4
CHUM SALMON (#)	-	-	-	17	2
PINK SALMON (#)	1	-	-	-	-
PACIFIC MACKEREL (#)	-	-	-	-	-
PACIFIC SANDLANCE (#)	1	-	-	-	-
PACIFIC HAKE (#)	-	-	-	1	-
EULACHON (#)	-	-	-	-	-
FLATFISH LARVAE (#)	53	20	-	-	-
RATFISH (#)	1	-	-	-	-
BLACK ROCKFISH (#)	-	2	-	-	-
KELP GREENLING (#)	-	-	1	-	-

Appendix 13 (cont'd)

Set Number	90	91	97	109	110
Area	Cape Alava	Cape Alava	Neah Bay	Juan de Fuca	Juan de Fuca
Date	04/18/98	04/18/98	04/19/98	04/20/98	04/20/98
Depth (m)	4	15	4	45	30
Latitude	48.26	48.25	48.38	48.44	48.48
Longitude	-125.13	-125.25	-124.55	-124.26	-124.39
Effort (hr)	1	1	0.5	0.67	1
Net headrope temp (°C)		-	-	-	-
Sardine catch (kg)	0.17	0.17	0.17	0.17	0.33
Sardine catch per hour (kg/hr)	0.17	0.17	0.33	0.25	0.33
PACIFIC SARDINE (#)	1	1	1	1	2
PACIFIC HERRING (#)	-	-	-	-	-
COHO SALMON (#)	-	-	-	-	-
CHINOOK SALMON (#)	-	-	-	-	-
CHUM SALMON (#)	-	-	-	-	-
PINK SALMON (#)	-	-	-	-	-
PACIFIC MACKEREL (#)	-	-	-	-	-
PACIFIC SANDLANCE (#)	-	-	-	-	-
PACIFIC HAKE (#)	-	-	-	-	-
EULACHON (#)	-	-	-	-	-
FLATFISH LARVAE (#)	-	-	-	-	-
RATFISH (#)	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	-	-	-
KELP GREENLING (#)	-	-	-	-	-

[a]From April 10 – 21, 1998, a total of 79 sets were completed off the west coast of Vancouver Island, from 50.53°N, 128.31°W to 46.92°N, 124.36°W, using a midwater rope trawl. A total of 75 sets were made in surface waters (≤ 45m). Of the surface tows, sardines were captured in 16 sets (Appendix 13a). Species captured along with sardines included coho and chinook salmon, pacific sandlance, and flatfish larvae.



Appendix 13a. Cruise 98-B, April 10 – 21, 1998. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 13b. Length frequency data, Cruise 98-B, April 10 - 21, 1998.

set	42	44	46	48	51	52	53	56	57	60	79	90	91	95	97	109	110	TOTAL
length																		
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2
10	-	-	-	2	-	1	-	1	1	2	-	-	-	-	-	-	1	8
11	-	1	1	2	2	0	1	2	1	7	-	-	-	1	-	-	-	18
12	-	-	1	1	3	1	-	3	2	6	1	-	-	-	-	-	-	18
13	-	-	-	-	-	-	-	-	-	1	0	-	-	-	-	-	-	1
14	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0
15	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0
16	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0
17	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0
18	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0
19	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0
20	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0
21	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
24	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
25	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
27	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
28	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																		53

Appendix 13c. Maturity data, Cruise 98-B April 10 - 21, 1998.

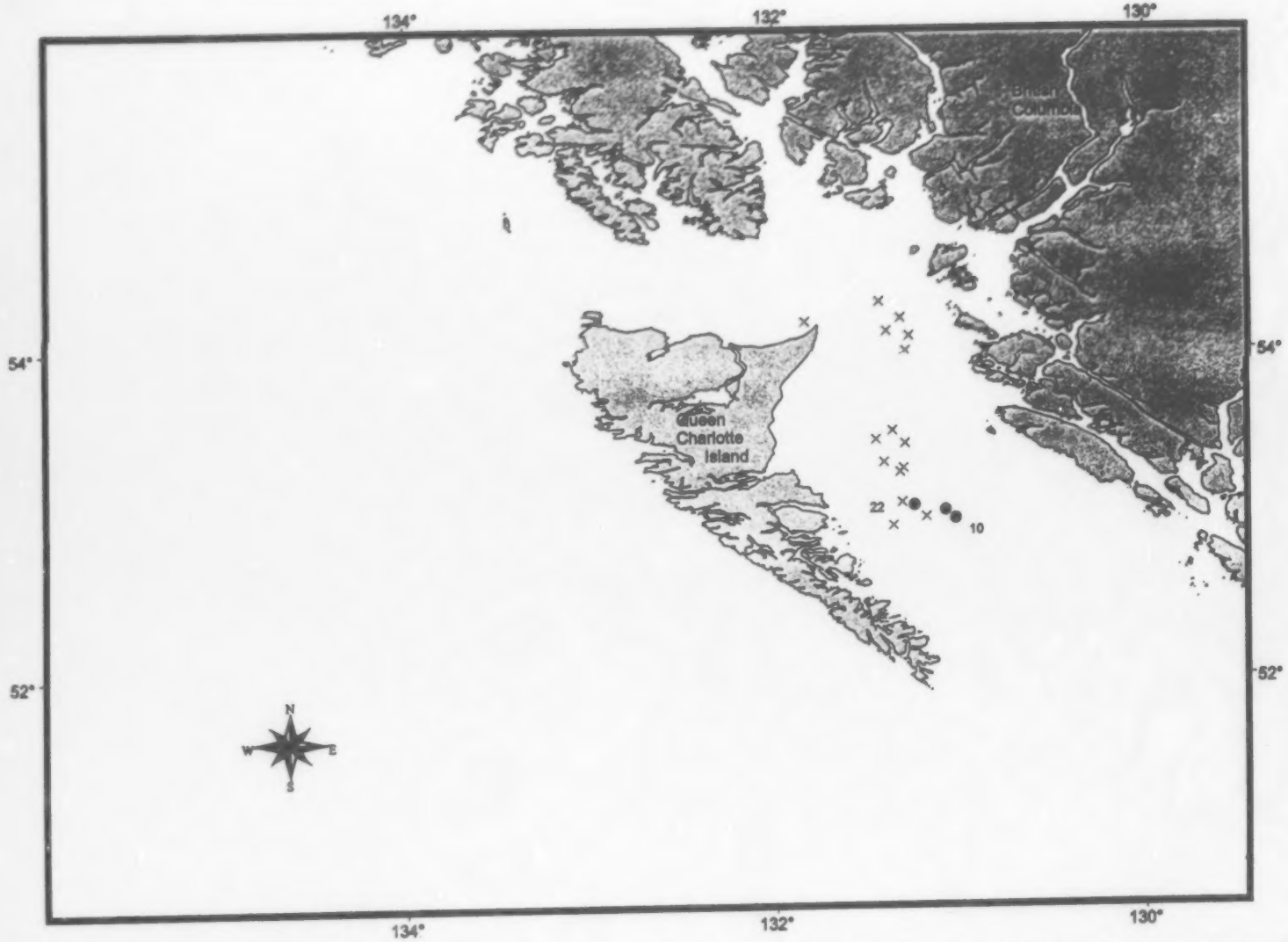
set	44	46	48	51	52	53	56	57	60	79	90	91	95	97	109	110	Total
Maturity																	
Immature	-	2	5	5	2	1	5	4	16	1	-	-	1	-	1	2	45
Maturing	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2+	-	-	-	-	-	-	-	-	-	1	1	1	-	1	-	-	4
Total																	50

Maturities were determined without sex determination.

Appendix 14. Set data, Cruise 98-C, Hecate Strait, June 1 – 20, 1998. Data is presented for sets with sardine catch only.[a]

Set Number	10	14	22
Area	Hecate Strait	Hecate Strait	Hecate Strait
Date	06/06/98	06/07/98	06/08/98
Depth (m)	55	25	28
Latitude	52.96	53.01	53.04
Longitude	-130.83	-130.89	-131.08
Effort (hr)	0.5	0.5	0.5
Net headrope temp (°C)	10.3	11.7	11.5
Sardine catch (kg)	0.1	18	0.1
Sardine catch per hour (kg/hr)	0.2	36	0.2
PACIFIC SARDINE (kg)	1	109	1
SANDLANCE (kg)	19	20	36
SPINY DOGFISH (kg)	10	-	11
BIG SKATE (kg)	3	-	18
PACIFIC SANDDAB (kg)	0.1	-	-
SPECKLED SANDDAB (kg)	0.1	0.1	1
PACIFIC HALIBUT (kg)	40	15	17
ROCK SOLE (kg)	12	38	54
ENGLISH SOLE (kg)	0.1	0.1	0.1
SAND SOLE (kg)	-	5	1
PACIFIC HERRING (kg)	-	2	0.1
LINGCOD (kg)	-	12	-
PACIFIC COD (kg)	-	0.1	-
PACIFIC TOMCOD (kg)	-	-	0.1
WALLEYE POLLOCK (kg)	-	-	0.1
SKIPJACK TUNA (kg)	-	-	0.1

[a]From June 1 – 20, 1998, a total of 88 sets were completed in Hecate Strait, from 54.30°N, 131.30°W to 52.96°N, 130.83°W, using a bottom trawl. A total of 18 sets were made in surface waters (≤ 45m). Sardines were captured in 3 sets; two were shallow sets (≤ 45m), one was a deeper set (set 10, 55m) (Appendix 14a). Species captured along with sardines included rock sole, Pacific halibut, Pacific sandlance, spiny dogfish and big skate.



Appendix 14a. Cruise 98-C, June 1 - 20, 1998. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 14b. Length frequency data, Cruise 98-C, June 1-20, 1998.

set	14
length	
5	-
6	-
7	-
8	-
9	-
10	9
11	45
12	25
13	2
14	-
15	-
16	-
17	-
18	-
19	-
20	-
21	-
22	-
23	-
24	-
25	-
26	-
27	-
28	-
29	-
30	-
31	-
32	-
33	-
34	-
35	-
Total	81

Appendix 15. Set data, Cruise 98-D, west coast Vancouver Island, June 24 – 30, 1998. Data is presented for sets with sardine catch only.[a]

Set Number	2	4	5	9	10	11
Area	WCVI	WCVI	QCS	Triangle	Estevan	Estevan
Date	06/24/98	06/24/98	06/24/98	06/24/98	06/25/98	06/25/98
Depth (m)	15	0	60	0	0	45
Latitude	50.72	50.69	-	50.51	49.11	49.11
Longitude	-128.69	-128.95	-	-129.43	-127.36	-127.24
Effort (hr)	0.5	1	1	0.75	0.5	1
Net headrope temp (°C)	9.2	10.2	7.7	12.5	11.6	9.1
Sardine catch (kg)	0.17	1.65	0.83	1.98	0.17	7.76
Sardine catch per hour (kg/hr)	0.33	1.65	0.83	2.64	0.33	7.76
PACIFIC SARDINE (#)	1	10	5	12	1	47
PACIFIC HERRING (#)	1	6	-	-	-	-
COHO SALMON (#)	0	-	-	-	-	-
CHINOOK SALMON (#)	-	1	-	1	-	-
CHUM SALMON (#)	11	-	-	-	-	-
PINK SALMON (#)	1	-	-	1	-	-
SOCKEYE SALMON (#)	-	1	-	-	-	-
DEEPSEA SOLE (#)	3	-	-	-	-	2
JACK MACKEREL (#)	-	1	-	2	12	2
PACIFIC MACKEREL (#)	-	1	-	1	-	-
WIDOW ROCKFISH (#)	-	-	-	1	-	-
OCEAN SUNPERCH (#)	-	-	-	1	-	-
WOLF EEL (#)	-	-	-	-	1	-
SILVERGRAY ROCKFISH (#)	58	-	-	-	1600	-
REDSTRIPE ROCKFISH (#)	-	-	-	-	51	-
YELLOWTAIL ROCKFISH (#)	-	-	-	-	-	-
PACIFIC HAKE (#)	-	-	-	-	-	-
DARKBLOTCHED ROCKFISH (#)	-	-	-	-	4	-

Appendix 15 (cont'd)

Set Number	12	14	20	28	29
Area	Nootka Sound	WCVI	WCVI	Washington	Washington
Date	06/25/98	06/25/98	06/25/98	06/27/98	06/27/98
Depth (m)	250	0	0	30	15
Latitude	-	49.13	48.87	48.13	48.08
Longitude	-	-126.86	-126.18	-124.97	-125.07
Effort (hr)	0.5	0.75	0.5	0.5	1
Net headrope temp (°C)	6.1	12	13.4	-	-
Sardine catch (kg)	1.32	3630	2640	1.815	0.495
Sardine catch per hour (kg/hr)	0.66	4840	5280	3.63	0.495
PACIFIC SARDINE (#)	4	22000	16000	11	3
PACIFIC HERRING (#)	-	-	-	-	-
COHO SALMON (#)	-	-	4	-	-
CHINOOK SALMON (#)	-	-	-	-	-
CHUM SALMON (#)	-	-	1	-	-
PINK SALMON (#)	-	-	-	-	-
SOCKEYE SALMON (#)	-	-	-	-	-
DEEPSEA SOLE (#)	-	-	-	-	-
JACK MACKEREL (#)	-	80	20	-	-
PACIFIC MACKEREL (#)	-	520	432	-	-
WIDOW ROCKFISH (#)	-	-	-	-	-
OCEAN SUNPERCH (#)	-	-	-	-	-
WOLF EEL (#)	-	-	-	-	-
SILVERGRAY ROCKFISH (#)	-	-	-	-	-
REDSTRIPE ROCKFISH (#)	-	-	-	-	-
YELLOWTAIL ROCKFISH (#)	-	-	1	-	-
PACIFIC HAKE (#)	-	-	1	-	-
DARKBLOTCHED ROCKFISH (#)	-	-	-	-	-

Appendix 15 (cont'd)

Set Number	30	33	34	35
Area	Washington	Cape Alava	JDF	JDF
Date	06/27/98	06/27/98	06/28/98	06/28/98
Depth (m)	0	0	30	15
Latitude	48.08	48.09	48.42	48.42
Longitude	-125.18	-125.59	-125.51	-125.44
Effort (hr)	1	1	0.5	0.5
Net headrope temp (°C)	-	-	-	-
Sardine catch (kg)	5775	3.96	21.95	3300
Sardine catch per hour (kg/hr)	5775	3.96	43.89	6600
PACIFIC SARDINE (#)	35000	24	133	20000
PACIFIC HERRING (#)	-	-	-	-
COHO SALMON (#)	-	-	-	-
CHINOOK SALMON (#)	-	-	-	-
CHUM SALMON (#)	-	-	-	-
PINK SALMON (#)	-	-	-	-
SOCKEYE SALMON (#)	-	-	-	-
DEEPSEA SOLE (#)	-	-	-	-
JACK MACKEREL (#)	-	-	4	5
PACIFIC MACKEREL (#)	83	4	2	690
WIDOW ROCKFISH (#)	-	-	-	-
OCEAN SUNPERCH (#)	-	-	-	-
WOLF EEL (#)	-	-	-	-
SILVERGRAY ROCKFISH (#)	-	-	-	-
REDSTRIPE ROCKFISH (#)	-	-	-	-
YELLOWTAIL ROCKFISH (#)	-	-	-	-
PACIFIC HAKE (#)	-	-	-	-
DARKBLOTCHED ROCKFISH (#)	-	-	-	-

[a]From June 24 – 30, 1998, a total of 37 sets were completed off the west coast of Vancouver Island, from 50.73°N, 128.59°W to 48.08°N, 125.07°W, using a rope trawl. A total of 34 sets were made in surface waters (≤ 45m). Sardines were captured in 13 shallow sets (≤ 45m), and two deeper sets (set 5, 60m; set 12, 250m) (Appendix 15a). Sardines were the exclusive catch in both deeper sets. Species captured along with sardines in other sets included Pacific mackerel, jack mackerel and silvergrey rockfish.

Appendix 15a. Cruise 98-D, June 24 - 30, 1998. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 15b. Length frequency data, Cruise 98-D, June 24 - 28, 1998.

	2	4			5			9		10	11		12			14			20			28			30			33			34			35			TOTAL		
set	U	M	F	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U
length																																							
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	0
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	1	-	-	-	-	-	-	-	-	3	2	1
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	4	3	0	14	20	1	0	-	-	2	-	-	4	2	-	25	25	1
21	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	0	2	28	25	2	2	-	-	4	4	-	5	1	-	41	31	4
22	-	1	1	1	-	-	-	-	-	2	1	-	2	1	1	7	6	1	-	1	-	32	46	0	2	5	1	30	18	-	18	14	-	95	93	3			
23	-	0	1	-	-	-	-	1	-	6	5	1	26	8	6	18	16	-	-	-	-	25	21	1	1	0	-	25	19	1	17	11	-	118	82	9			
24	-	1	1	-	1	-	2	6	-	16	11	2	55	49	9	14	30	-	-	-	-	7	18	-	5	1	-	9	16	-	7	13	1	116	146	12			
25	-	1	1	-	-	-	1	0	1	-	3	1	17	35	1	1	3	-	-	-	-	2	4	-	1	0	-	1	1	-	1	3	-	25	50	3			
26	1	1	1	-	-	-	-	2	-	-	2	-	2	13	-	-	1	-	-	-	-	-	-	-	2	1	-	2	1	-	1	1	-	8	22	1			
27	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	0	1	-	-	-	-	-	-	-	2	2	-			
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-			
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total																																		435	453	35			

Appendix 15c. Maturity data, Cruise 98-D June 24 - 30, 1998.

	2			5			11			14			28			30			33			
set	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	Total
Maturity																						
Immature	-	-	1	1	1	1	2	1	-	18	2	-	1	-	-	26	6	-	-	-	-	60
Ripening	-	-	-	-	-	-	-	-	-	26	29	-	-	-	-	15	46	-	-	-	-	116
Ripe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	-	5
Very ripe	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Spent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Total																						183

Appendix 15d. Stomach contents data, Cruise 98-D, June 24 - 30, 1998.

Set	# of stomachs	Total Volume (cc)	Digested Material (cc)	Scales (cc)	Phyto-plankton (cc)	Euphausiid (cc)	Cyclopoid (cc)	Filamentous Algae (cc)	Crab Megalops (cc)
14	27	14.41	3.04	4.25	3.63	-	0.025	-	0.38
29	30	16.35	2.23	-	7.5	1.3	-	0.75	-
TOTAL	57	30.76	5.27	4.25	11.13	1.3	0.025	0.75	0.38

Set	# of stomachs	Volume (cc)	Calanoid (cc)	Nauplii (cc)	Cypris (cc)	Euphausiid Eggs (cc)	Unidentified Eggs (cc)
14	27	14.41	0.024	0.1	0.01	2.83	0.001
29	30	16.35	0.04	-	-	3.79	-
TOTAL	57	30.76	0.064	0.1	0.01	6.62	0.001

Appendix 16. Set data, Cruise 98-E, south east Alaska and Queen Charlotte Islands, August 6 – 28, 1998. Data is presented for sets with sardine catch only.[a]

Set Number	14	24
Area	Cape Ommaney	-
Date	08/11/98	08/17/98
Depth (m)	35	45
Latitude	55.84	53.76
Longitude	135.32	130.88
Effort (hr)	0.67	0.47
Net headrope temp (°C)	14	14
Sardine catch (kg)	3.2	0.8
Sardine catch per hour (kg/hr)	4.8	1.30
PACIFIC SARDINE (kg)	3.2	0.8
PACIFIC HERRING (kg)	-	90.6
PINK SALMON (kg)	1.5	0.9
JELLYFISH (kg)	-	2.7

[a]From August 6 - 28, 1998, a total of 33 sets were completed from Dixon Entrance to Cape Ommaney, from 55.84°N, 135.32°W to 53.76°N, 130.88°W, using a rope trawl. A total of 5 sets were made in surface waters (≤ 45m), two of which contained sardines (Appendix 16a). Species captured along with sardines included Pacific herring and pink salmon.

Appendix 16a. Cruise 98-E, August 6 - 21, 1998. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 16b. Length frequency data, Cruise 98-E, August 11-17, 1998.

	14			24			TOTAL		
set	M	F	U	M	F	U	M	F	U
length									
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	2	-	-	2
14	-	-	-	-	-	8	-	-	8
15	-	-	-	-	-	12	-	-	12
16	-	-	-	-	-	1	-	-	1
17	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-
24	3	4	-	-	-	-	3	4	-
25	2	5	-	-	-	-	2	5	-
26	-	2	-	-	-	-	-	2	-
27	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-
Total							5	11	23

Appendix 16c. Stomach contents data, Cruise 98-E, August 6 - 21, 1998.

Set	# of stomachs	Total Volume (cc)	Digested Material (cc)	Amphipod (cc)	Calanoid (cc)	Euphausiid (cc)	Fish Larvae (cc)	Crab Megalops (cc)
14	13	11.4	0	0.52	0.89	9.7	0.24	0.01

Appendix 17. Set data, Cruise 98-F, west coast Vancouver Island, September 8 – 24, 1998. Data is presented for sets with sardine catch only.[a]

Set Number	105	116	118	119	120	121
Area	Washington	Finger Bank	Finger Bank	Finger Bank	Cape Beale	Cape Beale
Date	09/18/98	09/19/98	09/19/98	09/19/98	09/19/98	09/19/98
Depth (m)	4	4	4	-	4	4
Latitude	48.37	48.60	48.64	48.00	48.71	48.72
Longitude	-125.14	-125.31	-125.44	125.00	-125.39	-125.29
Effort hr	0.5	0.5	0.5	-	0.5	0.5
Net headrope temp (°C)	-	12	-	-	-	11
Sardine catch (kg)	1254	0.17	0.50	0.33	2.48	4.62
Sardine catch (kg/hr)	2508	0.33	0.99	-	4.95	9.24
PACIFIC SARDINE (#)	7600	1	3	2	15	28
CHINOOK SALMON (#)	-	-	-	-	-	1
COHO SALMON (#)	4	7	13	3	7	10
PINK SALMON (#)	-	-	-	1	-	-
JACK MACKEREL (#)	-	-	17	-	-	-
PACIFIC MACKEREL (#)	13	3	26	2	-	-
PACIFIC HAKE (#)	1	-	-	-	-	-
ROCKFISH (#)	1	-	-	-	-	-
JELLYFISH (#)	-	-	-	1	1	-

[a]From September 8 - 24, 1998, a total of 44 sets were completed off the west coast of Vancouver Island, from 48.71°N, 125.39°W to 48.18°N, 123.64°W, using a rope trawl. A total of 40 sets were made in surface waters (≤ 45m). Of the surface tows, sardines were captured in 6 sets (Appendix 17a). Species captured along with sardines included Pacific mackerel, jack mackerel and coho salmon.

Appendix 17a. Cruise 98-F, September 8 - 24, 1998. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 17b. Length frequency data, Cruise 98-F, September 8-24, 1998.

	105			116			118	119	121	TOTAL
set	M	F	U	M	F	U				
length										
5	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-
21	1	-	-	-	-	-	-	-	-	1
22	16	5	7	2	2	1	1	-	-	34
23	10	12	26	9	7	38	0	-	7	109
24	18	6	67	9	11	77	1	1	8	198
25	3	8	60	8	8	58	1	1	9	156
26	2	2	25	0	4	21	-	-	3	57
27	0	0	7	1	2	7	-	-	1	18
28	1	0	3	0	1	5	-	-	-	10
29	-	-	0	-	-	1	-	-	-	1
30	-	-	1	-	-	-	-	-	-	1
31	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-
Total										585

Appendix 17c. Stomach contents data, Cruise 98-F, September 8 - 24, 1998

Set	# of stomachs	Total Volume (cc)	Digested Material (cc)	Barnacle Naupli (cc)	Scales (cc)	Euphausiid (cc)	Amphipod (cc)	Phyto-plankton (cc)	Gastropod (cc)	Cyclopoid (cc)	Calanoid (cc)
105	35	7.38	0.91	0.01	6.12	0.06	0.02	0.001	0.04	0.001	0.22

Appendix 18. Set data, Cruise 98-G, Strait of Georgia and Juan de Fuca Strait, November 17 – 28, 1998. Data is presented for sets with sardine catch only.[a]

Set Number	1	11	24	25	35	42
Area	Cape Mudge	NE Little River	Hornby Island	Cape Lazo	Gower Point	Thrasher rock
Date	11/17/98	11/17/98	11/19/98	11/19/98	11/20/98	11/20/98
Depth (m)	surf	15	surf	surf	surf	15
Latitude	49.98	49.82	49.63	49.71	49.34	49.17
Longitude	-125.08	-124.78	-124.77	-124.82	-123.56	-123.54
Effort (hr)	0.5	0.5	0.5	0.5	0.5	0.5
Net headrope temp (°C)	-	-	-	-	-	-
Sardine catch (kg)	0.17	0.50	0.33	12.87	0.17	0.17
Sardine catch per hour (kg/hr)	0.33	0.99	0.66	25.74	0.33	0.33
PACIFIC SARDINE (#)	1	3	2	78	1	1
COHO SALMON (#)	1	4	1	-	22	3
CHINOOK SALMON (#)	6	2	2	1	6	5
CHUM SALMON (#)	3	2	1	4	95	144
PINK SALMON (#)	1	-	4	-	66	7
SOCKEYE SALMON (#)	-	-	-	-	1	10
PACIFIC HERRING (#)	86	1	2	1272	176	-
PACIFIC HAKE (#)	-	4	-	-	7	-
JACK MACKEREL (#)	-	-	-	-	-	-
SPINY DOGFISH (#)	-	1	-	-	-	-
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
BROWN IRISH LORD (#)	2	-	-	-	-	-
WALLEYE POLLOCK (#)	-	-	-	-	-	-
CALIFORNIA HEADLIGHTFISH (#)	-	13	-	-	-	-
MYCTOPHID (#)	-	-	-	-	1	-
SMELT (#)	-	-	-	-	1	-
ANCHOVY (#)	-	-	-	-	7	-
EULACHON (#)	-	-	-	-	1	-
SQUID (#)	-	27	21	-	-	2

Appendix 18 (cont'd)

Set Number	46	49	93	94	95	96
Area	North Arm	Sand Heads	Juan de Fuca	Pillar Point	Pillar Point	Slip Point
Date	11/20/98	11/21/98	11/25/98	11/25/98	11/25/98	11/25/98
Depth (m)	30	15	45	15	30	15
Latitude	49.22	49.05	48.20	48.22	48.25	48.28
Longitude	-123.30	-123.28	-123.81	-124.04	-124.14	-124.25
Effort (hr)	0.5	0.5	0.5	0.5	0.5	0.5
Net headrope temp (°C)	-	-	11.4	11.4	9	10.8
Sardine catch (kg)	0.17	0.50	4.29	0.50	1.49	1.65
Sardine catch per hour (kg/hr)	0.33	0.99	8.58	0.99	2.97	3.30
PACIFIC SARDINE (#)	1	3	26	3	9	10
COHO SALMON (#)	-	2	-	-	-	-
CHINOOK SALMON (#)	4	8	10	26	1	42
CHUM SALMON (#)	-	-	4	2	-	-
PINK SALMON (#)	-	-	-	-	-	-
SOCKEYE SALMON (#)	-	-	-	-	-	-
PACIFIC HERRING (#)	581	865	744	248	167	97
PACIFIC HAKE (#)	178	-	-	-	1	-
JACK MACKEREL (#)	-	-	-	-	1	-
SPINY DOGFISH (#)	4	-	-	-	-	-
PACIFIC SANDLANCE (#)	2	-	-	-	6	-
BROWN IRISH LORD (#)	-	-	-	-	-	-
WALLEYE POLLOCK (#)	688	-	-	-	-	-
CALIFORNIA HEADLIGHTFISH (#)	-	-	-	-	-	-
MYCTOPHID (#)	1	-	58	-	-	-
SMELT (#)	2	-	49	37	53	28
ANCHOVY (#)	33	-	-	-	1	1
EULACHON (#)	1	-	-	-	287	-
SQUID (#)	-	-	-	-	28	-
THREESPINE STICKLEBACK (#)	5	-	-	-	-	-
TURBOT (#)	-	-	-	-	-	-
OCEAN SUNFISH (#)	-	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	-	-	-	-
SABLEFISH (#)	-	-	-	-	-	-
WIDOW ROCKFISH (#)	-	-	-	-	-	-
REX SOLE (#)	-	-	-	-	-	-
PACIFIC SANDDAB (#)	-	-	-	-	-	-
SLIPSKIN SNAILFISH (#)	-	-	-	-	-	-
STARRY FLOUNDER (#)	6	-	-	-	-	-
AMERICAN SHAD (#)	2	-	-	-	1	-
SNAKE PRICKLEBACK (#)	3	-	-	-	-	-
SHINER PERCH (#)	12	-	-	-	-	-
RIVER LAMPREY (#)	1	-	-	-	-	-
PACIFIC SANDFISH (#)	-	-	-	-	2	1

Appendix 18 (cont'd)

Set Number	98	99	100	101	102	103
Area	Shipwreck	Seal Rocks	Pt. San Juan	Bonilla Point	Ent. to JDF	Tatoosh Island
Date	11/25/98	11/25/98	11/26/98	11/26/98	11/26/98	11/26/98
Depth (m)	surf	30	surf	45	30	surf
Latitude	48.36	48.40	48.51	48.53	48.53	48.43
Longitude	-124.47	-124.56	-124.62	-124.68	-124.88	-124.68
Effort (hr)	0.5	0.5	0.5	0.08	0.5	0.5
Net headrope temp (°C)	11.6	11.5	11.5	11.6	12	11.8
Sardine catch (kg)	0.17	7.59	9.41	169.95	25.08	32.18
Sardine catch per hour (kg/hr)	0.33	15.18	18.81	2039.48	50.16	64.35
PACIFIC SARDINE (#)	1	46	57	1030	152	195
COHO SALMON (#)	10	-	-	-	-	2
CHINOOK SALMON (#)	38	9	7	1	24	202
CHUM SALMON (#)	1	-	2	2	3	2
PINK SALMON (#)	-	-	12	-	-	11
SOCKEYE SALMON (#)	-	-	-	-	-	-
PACIFIC HERRING (#)	-	270	148	-	114	3276
PACIFIC HAKE (#)	1	3	1	4	1	1
JACK MACKEREL (#)	-	-	-	1	-	-
SPINY DOGFISH (#)	2	22	-	-	-	-
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
BROWN IRISH LORD (#)	-	-	-	-	-	-
WALLEYE POLLOCK (#)	-	1	-	-	-	-
CALIFORNIA HEADLIGHTFISH (#)	-	-	-	-	-	-
MYCTOPHID (#)	-	-	-	-	-	-
SMELT (#)	-	-	23	-	-	153
ANCHOVY (#)	-	-	-	-	-	2
EULACHON (#)	-	-	-	-	-	-
SQUID (#)	-	-	-	-	201	-
THREESPINE STICKLEBACK (#)	-	-	-	-	-	-
TURBOT (#)	-	-	1	-	-	-
OCEAN SUNFISH (#)	-	-	1	-	-	-
BLACK ROCKFISH (#)	-	-	-	1	-	1
SABLEFISH (#)	-	-	-	-	-	-
WIDOW ROCKFISH (#)	-	-	-	-	-	-
REX SOLE (#)	-	-	-	-	-	-
PACIFIC SANDDAB (#)	-	-	-	-	-	-
SLIPSKIN SNAILFISH (#)	-	-	-	-	-	-
STARRY FLOUNDER (#)	-	10	-	-	-	-
AMERICAN SHAD (#)	1	5	-	3	-	21
SNAKE PRICKLEBACK (#)	-	-	-	-	-	-
SHINER PERCH (#)	-	-	-	-	-	-
RIVER LAMPREY (#)	-	-	-	-	-	-
PACIFIC SANDFISH (#)	1	2	2	-	-	2
YELLOWTAIL ROCKFISH (#)	-	1	-	-	-	-
BIG SKATE (#)	-	1	-	-	-	-
CANARY ROCKFISH (#)	-	1	-	-	-	-
PLAINFIN MIDSHIPMAN (#)	-	1	-	-	-	-
LINGCOD (#)	-	1	-	-	-	-

Appendix 18 (cont'd)

Set Number	104	"not 105"*	105	106	107	108
Area	Neah Bay	Carmannah	Bonilla Point	Port San Juan	Sombrio Point	Sombrio Point
Date	11/26/98	11/27/98	11/27/98	11/27/98	11/27/98	11/27/98
Depth (m)	30	surf	15	30	60	surf
Latitude	48.42	48.56	48.53	48.50	48.46	48.43
Longitude	-124.61	-124.70	-124.57	-124.45	-124.35	-124.24
Effort (hr)	0.5	0.02	0.5	0.5	0.5	0.45
Net headrope temp (°C)	11.6	-	-	11.5	10	10.6
Sardine catch (kg)	28.88	2722	33.66	185.30	14.69	0.33
Sardine catch per hour (kg/hr)	57.75	136100	67.32	370.59	29.37	0.73

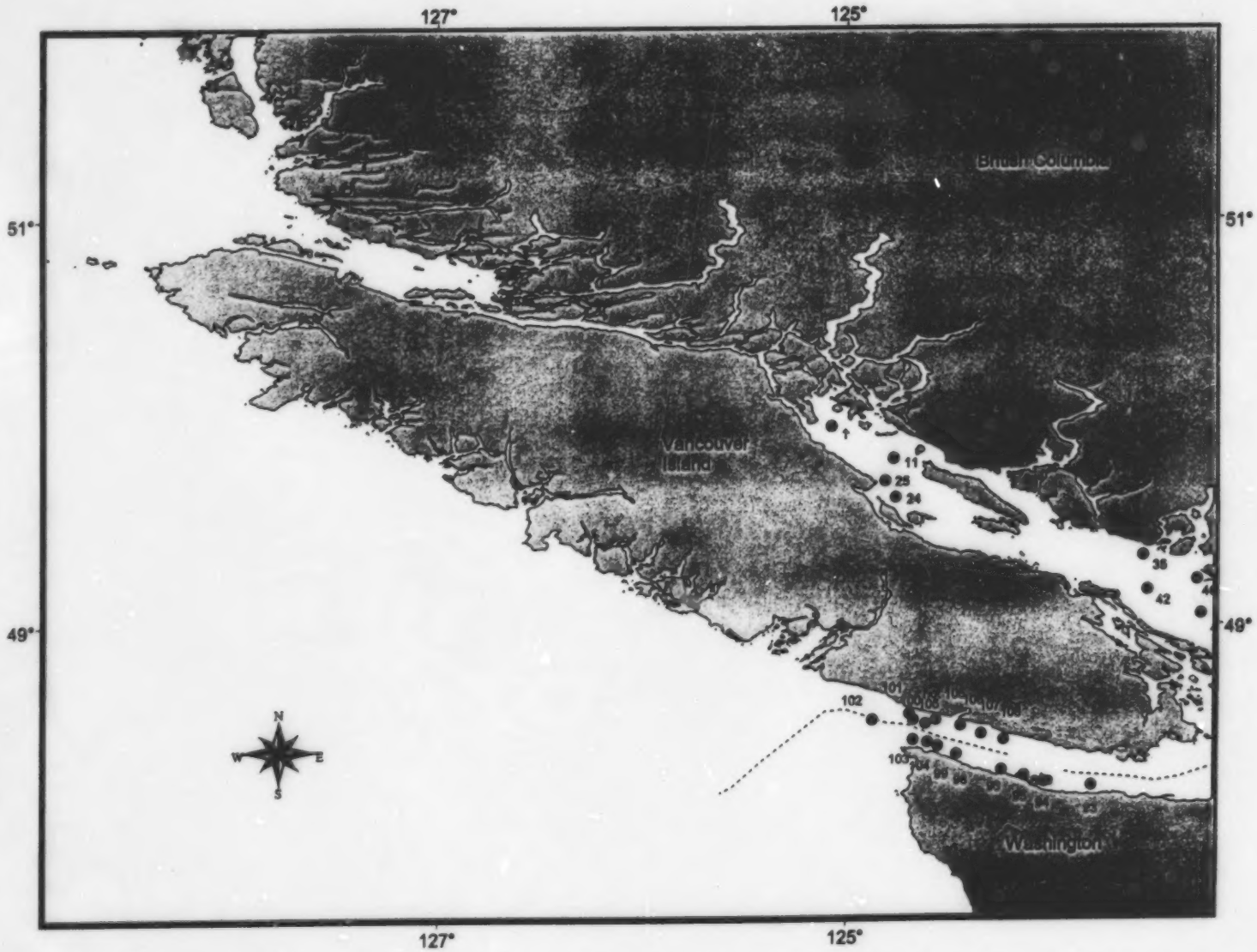
*This set was not counted as the actual "105": it was aborted due to major sardine concentration.

PACIFIC SARDINE (#)	175	-	204	1123	89	2
COHO SALMON (#)	-	-	-	-	-	3
CHINOOK SALMON (#)	7	-	13	7	4	66
CHUM SALMON (#)	-	-	1	2	-	361
PINK SALMON (#)	-	-	-	-	-	214
SOCKEYE SALMON (#)	-	-	-	-	-	-
PACIFIC HERRING (#)	114	-	40	3	161	16
PACIFIC HAKE (#)	13	-	1	1	7	-
JACK MACKEREL (#)	-	-	-	-	-	-
SPINY DOGFISH (#)	-	-	1	1	17	-
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
BROWN IRISH LORD (#)	-	-	-	-	-	-
WALLEYE POLLOCK (#)	-	-	-	-	-	-
CALIFORNIA HEADLIGHTFISH (#)	-	-	-	-	-	-
MYCTOPHID (#)	-	-	-	-	3	-
SMELT (#)	41	-	222	64	585	-
ANCHOVY (#)	80	-	7	2960	87	-
EULACHON (#)	27	-	-	-	-	-
SQUID (#)	20	-	12	1016	16	-
THREESPINE STICKLEBACK (#)	-	-	-	-	-	-
TURBOT (#)	-	-	-	-	-	-
OCEAN SUNFISH (#)	-	-	-	-	-	-

Appendix 18 (cont'd)

Set Number	104	*not 105**	105	106	107	108
Area	Neah Bay	Carmannah	Bonilla Point	Port San Juan	Sombrio Point	Sombrio Point
Date	11/26/98	11/27/98	11/27/98	11/27/98	11/27/98	11/27/98
Depth (m)	30	surf	15	30	60	surf
Latitude	48.42	48.56	48.53	48.50	48.46	48.43
Longitude	-124.61	-124.70	-124.57	-124.45	-124.35	-124.24
Effort (hr)	0.5	0.02	0.5	0.5	0.5	0.45
Net headrope temp (°C)	11.6	-	-	11.5	10	10.6
Sardine catch (kg)	28.88	2722	33.66	185.30	14.69	0.33
Sardine catch per hour (kg/hr)	57.75	136100	67.32	370.59	29.37	0.73
*This set was not counted as the actual "105": it was aborted due to major sardine concentration.						
BLACK ROCKFISH (#)	-	-	-	-	-	-
SABLEFISH (#)	-	-	1	-	-	-
WIDOW ROCKFISH (#)	-	-	-	1	-	-
REX SOLE (#)	-	-	-	8	1	-
PACIFIC SANDDAB (#)	-	-	-	-	15	-
SLIPSKIN SNAILFISH (#)	-	-	-	-	1	-
STARRY FLOUNDER (#)	-	-	-	-	-	-
AMERICAN SHAD (#)	-	-	-	1	-	-
SNAKE PRICKLEBACK (#)	-	-	-	-	-	-
SHINER PERCH (#)	-	-	-	-	-	-
RIVER LAMPREY (#)	-	-	-	-	-	-
PACIFIC SANDFISH (#)	-	10	2	-	-	-
YELLOWTAIL ROCKFISH (#)	-	-	-	1	-	-

From November 17 - 28, 1998, a total of 117 sets were completed; 96 sets in the Strait of Georgia, 21 in the Strait of Juan de Fuca, from 49.98°N, 125.08°W to 48.18°N, 123.57°W, using a rope trawl. For the Strait of Georgia, only the sets in which sardines were captured are discussed here, or shown on the map (Appendix 18a). Sardines were captured in 8 sets in the Strait of Georgia. Within the Strait of Juan de Fuca total of 20 sets were made in surface waters (≤ 45m). Of these surface tows, sardines were captured in 7 sets. Species captured along with sardines included northern anchovy, Pacific herring, whitebait smelt, chinook salmon, and spiny dogfish.



Appendix 18a. Cruise 98-G, November 17 - 28, 1998. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 18b. Length frequency data, Cruise 98-G, November 17-28, 1998.

	1	11	24	25	35	42	46	49	93	94	96	100	101			103	108	TOTAL		
set													M	F	U			M	F	U
length																				
5	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
6	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0
7	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
8	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0
9	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
10	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
11	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0
13	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0
14	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	1	-	-	-	6
15	-	-	-	1	-	-	-	-	5	2	-	14	5	-	-	5	-	5	-	27
16	-	-	-	4	-	-	-	-	16	1	6	22	3	3	-	6	-	3	3	55
17	-	-	-	6	-	-	-	2	6	-	1	7	1	3	1	9	-	1	3	32
18	-	-	-	1	-	-	-	-	-	-	2	1	2	1	0	0	-	2	1	4
19	-	-	1	0	-	-	-	-	-	-	-	1	0	0	0	0	-	0	0	2
20	-	-	0	0	-	-	-	-	-	-	-	0	0	0	0	0	-	0	0	0
21	-	-	1	1	-	-	-	-	-	-	-	1	0	0	1	1	-	0	0	5
22	-	1	-	1	-	-	-	-	-	-	-	0	0	0	1	3	-	0	0	6
23	-	0	-	7	-	-	-	-	-	-	-	1	1	2	16	6	2	1	2	32
24	-	1	-	16	-	1	-	1	-	-	-	0	3	3	25	13	-	3	3	57
25	1	1	-	18	1	-	1	-	-	-	-	1	4	2	14	5	-	4	2	42
26	-	-	-	3	-	-	-	-	-	-	-	-	1	3	5	1	-	1	3	9
27	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																		21	17	281

Appendix 19. Cruise data, commercial fishery cruises in which sardine bycatch was sampled.[a]

Cruise #	Vessel Name	Cruise start	Cruise end	Set #
29200	ARCTIC OCEAN	*	*	8
28718	ARCTIC OCEAN	6/21/1998	7/22/1998	3014130
28713	SUN MAIDEN	6/1/1998	8/7/1998	3007279
28712	CALEDONIAN	6/1/1998	8/24/1998	3014186
28693	EASTWARD HO	6/23/1998	8/24/1998	3007114 3007163
28690	VIKING STORM	6/19/1998	8/24/1998	3007154 3007168
28732	GULF SPIRIT	6/23/1998	8/27/1998	3035154 3035167 3035128 3035147
28716	PACIFIC HARVESTER	6/23/1998	8/29/1998	3035170 3035193 3035341 3035350

* Start and end dates not available; however sample from set 8 was taken on April 28, 1998.

[a]From April to August, 1998, sardine samples were collected by observers on board commercial fishing vessels, off the west coast of Vancouver Island. The sardines were netted as bycatch, using commercial fishing gear. Details of set location, gear depth, and associated catch is unavailable; however 923 sardines were sampled to provide a length frequency from this bycatch.

Appendix 19a. Length - frequency, observer data from commercial fishery, 1998.

cruise	28718	28713	28712	28693		29690		28732				28716				29200	
set	3014130	3007279	3014186	3007114	3007163	3007154	3007168	3035154	3035167	3035128	3035147	3035170	3035193	3035341	3035350	8	Total
FL (cm)																	
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	16
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	30
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	13
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
20	-	-	12	-	-	1	-	-	-	-	-	10	6	1	-	-	30
21	3	2	12	4	1	3	-	-	5	-	1	20	4	1	-	-	56
22	9	19	12	17	12	19	2	3	3	-	1	19	15	7	1	-	139
23	15	33	14	36	23	28	8	10	21	6	4	12	29	12	5	-	256
24	9	30	7	20	18	33	7	7	15	5	7	3	7	22	21	-	211
25	5	8	2	7	5	4	11	4	6	1	2	5	4	11	30	-	105
26	2	0	2	3	1	2	3	1	3	1	2	-	1	3	21	-	45
27	-	1	4	1	-	0	3	-	0	-	-	-	-	2	8	-	19
28	-	-	1	-	-	2	-	-	1	-	-	-	-	1	3	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																62	923

Appendix 20. Set data, Cruise 99-A, west coast Vancouver Island, February 12 – March 6, 1999. Data is presented for sets with sardine catch only.[a]

Set Number	77	78	79	80	83	84
Area	Bonillo Point	Carmannah	Swiftsure	Swiftsure	Barkley Sound	Barkley Sound
Date	03/01/99	03/01/99	03/01/99	03/01/99	03/02/99	03/02/99
Depth (m)	surf	30	15	10	surf	15
Latitude	48.56	48.57	48.61	48.60	48.00	48.80
Longitude	-124.77	-124.86	-124.95	-125.08	-125.00	-125.67
Effort (hr)	0.5	0.5	0.5	0.5	0.5	0.5
Net headrope temp (°C)	8.5	8	8.7	8.9	8.3	8.6
Sardine catch (kg)	0.17	0.17	30.86	41.09	0.33	0.17
Sardine catch per hour (kg/hr)	0.33	0.33	61.71	82.17	0.66	0.33
PACIFIC SARDINE (#)	1	1	187	249	2	1
COHO SALMON (#)	2	-	1	13	2	12
CHINOOK SALMON (#)	11	8	14	12	4	13
PACIFIC HERRING (#)	16	2	1	-	6	34
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
WHITEBAIT SMELT (#)	4	70	4	-	-	-
EULACHON (#)	-	5	-	-	-	-
PACIFIC SANDFISH (#)	-	1	-	-	-	-
FLATHEAD SOLE (#)	-	-	2	1	-	-
STICKLEBACK (#)	-	-	-	41	1	-
PACIFIC HAKE (#)	-	-	-	-	-	-
SPINY LUMPSUCKER (#)	-	-	-	-	-	-
SALPS (#)	-	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	-	-	-	-
SPINY DOGFISH (#)	-	-	-	-	-	-
ANCHOVY (#)	-	-	-	-	-	-
RATFISH (#)	-	-	-	-	-	-
LARVAL ROCKFISH (#)	-	-	-	-	-	-
LARVAL FLATFISH (#)	-	-	-	-	-	-
SQUID (#)	-	15	-	-	-	-

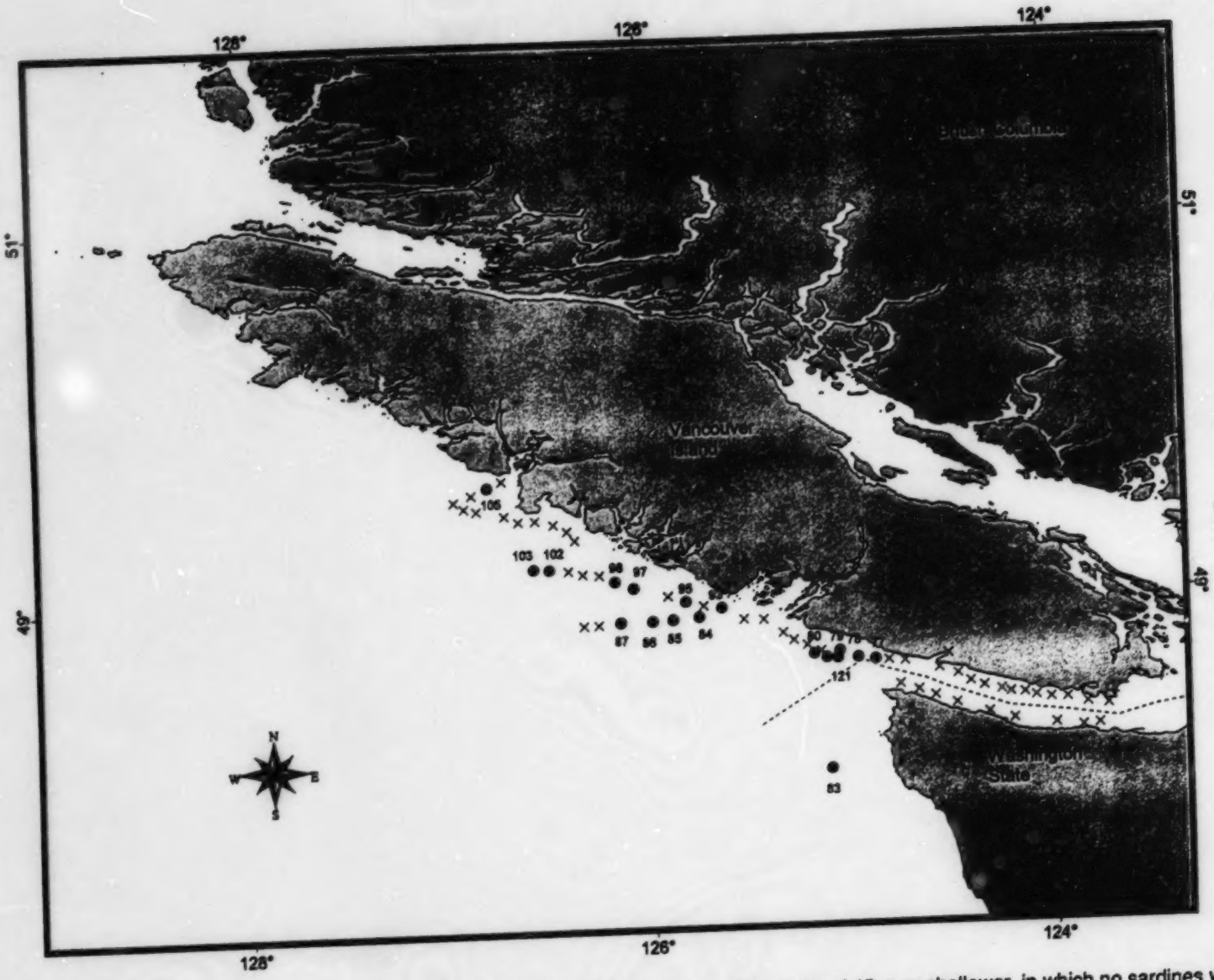
Appendix 20 (cont'd)

Set Number	85	86	87	93	95	97
Area	La Perouse	La Perouse	La Perouse	Amphitrite	Amphitrite	La Perouse
Date	03/02/99	03/02/99	03/02/99	03/04/99	03/04/99	03/04/99
Depth (m)	surf	15	surf	15	15	25
Latitude	48.79	48.79	48.78	48.85	48.89	48.96
Longitude	-125.8	-125.90	-126.07	-125.55	-125.73	-126.00
Effort (hr)	0.5	0.5	0.5	0.5	0.5	0.5
Net headrope temp (°C)	8.6	8.6	8.6	8.2	8.2	8.6
Sardine catch (kg)	2.475	0.66	146.685	0.165	0.33	4.455
Sardine catch per hour (kg/hr)	4.95	1.32	293.37	0.33	0.66	8.91
PACIFIC SARDINE (#)	15	4	889	1	2	27
COHO SALMON (#)	14	1	1	-	1	
CHINOOK SALMON (#)	4	4	3	11	3	5
PACIFIC HERRING (#)	7	-	-	61	163	183
PACIFIC SANDLANCE (#)	-	-	-	-	-	-
WHITEBAIT SMELT (#)	-	-	-	52	-	-
EULACHON (#)	-	-	-	-	-	-
PACIFIC SANDFISH (#)	-	-	-	-	-	-
FLATHEAD SOLE (#)	-	-	-	-	-	-
STICKLEBACK (#)	-	-	-	-	-	-
PACIFIC HAKE (#)	-	-	2	-	-	-
SPINY LUMPSUCKER (#)	-	-	-	1	-	-
SALPS (#)	-	-	-	2	-	-
BLACK ROCKFISH (#)	-	-	-	-	-	-
SPINY DOGFISH (#)	-	-	-	-	1	-
ANCHOVY (#)	-	-	-	-	1	-
RATFISH (#)	-	-	-	-	-	-
LARVAL ROCKFISH (#)	-	-	-	-	-	-
LARVAL FLATFISH (#)	-	-	-	-	-	-
SQUID (#)	-	-	-	-	12	-

Appendix 20 (cont'd)

Set Number	102	103	105	120	121
Area	Clayoquot	Clayoquot	Nootka	Swiftsure	Swiftsure
Date	03/04/99	03/04/99	03/05/99	03/06/99	03/06/99
Depth (m)	15	15	15	30	surf
Latitude	49.07	49.07	49.51	48.57	48.57
Longitude	-126.43	-126.51	-126.74	-125.02	-124.96
Effort (hr)	0.5	0.5	0.5	0.5	0.5
Net headrope temp (°C)	8.5	8.5	8.1	7.3	8
Sardine catch (kg)	0.17	0.66	0.165	1.155	0.99
Sardine catch per hour (kg/hr)	0.33	1.32	0.33	2.31	1.98
PACIFIC SARDINE (#)	1	4	1	7	6
COHO SALMON (#)	2	1	1	-	3
CHINOOK SALMON (#)	6	2	7	3	2
PACIFIC HERRING (#)	11	-	37	528	43
PACIFIC SANDLANCE (#)	-	-	1	-	-
WHITEBAIT SMELT (#)	-	-	-	1	-
EULACHON (#)	1	-	-	-	-
PACIFIC SANDFISH (#)	-	-	-	-	-
FLATHEAD SOLE (#)	-	-	-	-	-
STICKLEBACK (#)	-	-	-	1	
PACIFIC HAKE (#)	-	-	-	-	-
SPINY LUMPSUCKER (#)	-	-	-	-	-
SALPS (#)	-	-	-	-	-
BLACK ROCKFISH (#)	-	-	1	-	-
SPINY DOGFISH (#)	-	-	-	-	-
ANCHOVY (#)	-	-	-	-	-
RATFISH (#)	-	-	-	-	-
LARVAL ROCKFISH (#)	-	-	-	-	-
LARVAL FLATFISH (#)	-	-	-	1	-
SQUID (#)	-	-	-	-	-

From February 12 – March 6, 1999, a total of 68 sets were completed off the west coast of Vancouver Island, from 49.47°N, 126.82°W to 48.19°N, 123.62°W, using a rope trawl. A total of 63 sets were made in surface waters (≤ 45m). Of these surface tows, sardines were captured in 19 sets (Appendix 20a). Species captured along with sardines included Pacific herring, coho and chinook salmon, and whitebait smelt.



Appendix 20a. Cruise 99-A, February 12 – March 6, 1999. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 20b. Length frequency data, Cruise 99-A, February 12 - March 6, 1999.

Set#	77	78	79	80	83	84	85	86	87	93	95	97	98	102	103	105	120	121	Total
Length (cm)																			
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
14	-	-	-	-	-	-	-	-	-	-	-	0	-	-	1	-	3	1	32
15	-	-	7	10	1	1	1	-	5	1	1	6	1	-	3	1	3	1	125
16	1	-	36	38	1	-	10	2	22	-	0	9	0	1	-	-	1	4	123
17	-	1	29	32	-	-	4	1	40	-	1	5	1	-	-	-	-	-	36
18	-	-	1	16	-	-	-	1	12	-	-	2	0	-	-	-	-	-	5
19	-	-	1	2	-	-	-	-	-	-	-	1	1	-	-	-	-	-	3
20	-	-	-	1	-	-	-	-	-	-	-	0	0	-	-	-	-	-	0
21	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	2
22	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																			328

Appendix 21. Set data, Cruise 99-B, Queen Charlotte Strait and Hecate Strait, June 1 – 6, 1999. Data is presented for sets with sardine catch only.[a]

Set Number	122
Area	Hecate Strait
Date	06/15/99
Depth (m)	58.52
Latitude	51.43
Longitude	-128.09
Effort (hr)	0.07
Net headrope temp (°C)	-
Sardine catch (kg)	0.1
Sardine catch per hour (kg/hr)	1.43
PACIFIC HERRING (kg)	1
EULACHON (kg)	1
PACIFIC COD (kg)	1
WALLEYE POLLOCK (kg)	2
EELPOUT (kg)	0.1
PACIFIC OCEAN PERCH (kg)	1
REDBANDED ROCKFISH (kg)	2
SPINY DOGFISH (kg)	0.1
SABLEFISH (kg)	0.1
LINGCOD (kg)	4
LONGNOSE SKATE (kg)	3
ARROWTOOTH FLOUNDER (kg)	3
REX SOLE (kg)	1
FLATHEAD SOLE (kg)	4
SLENDER SOLE (kg)	1
DOVER SOLE (kg)	0.1
SPOTTED RATFISH (kg)	0.1

[a]From June 1 – 6, 1999, a total of 133 sets were completed in Queen Charlotte Strait and Hecate Strait, from 51.79°N, 129.21°W to 50.89°N, 128.16°W, using a bottom trawl. A total of 18 sets were made in surface waters (≤ 45m). One set contained sardines (set 122, 58m) (Appendix 21a). Species also captured in set 122 included lingcod, longnose skate, arrowtooth flounder, and flathead sole.

Appendix 21a. Cruise 99-B, June 1 - 16, 1999. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

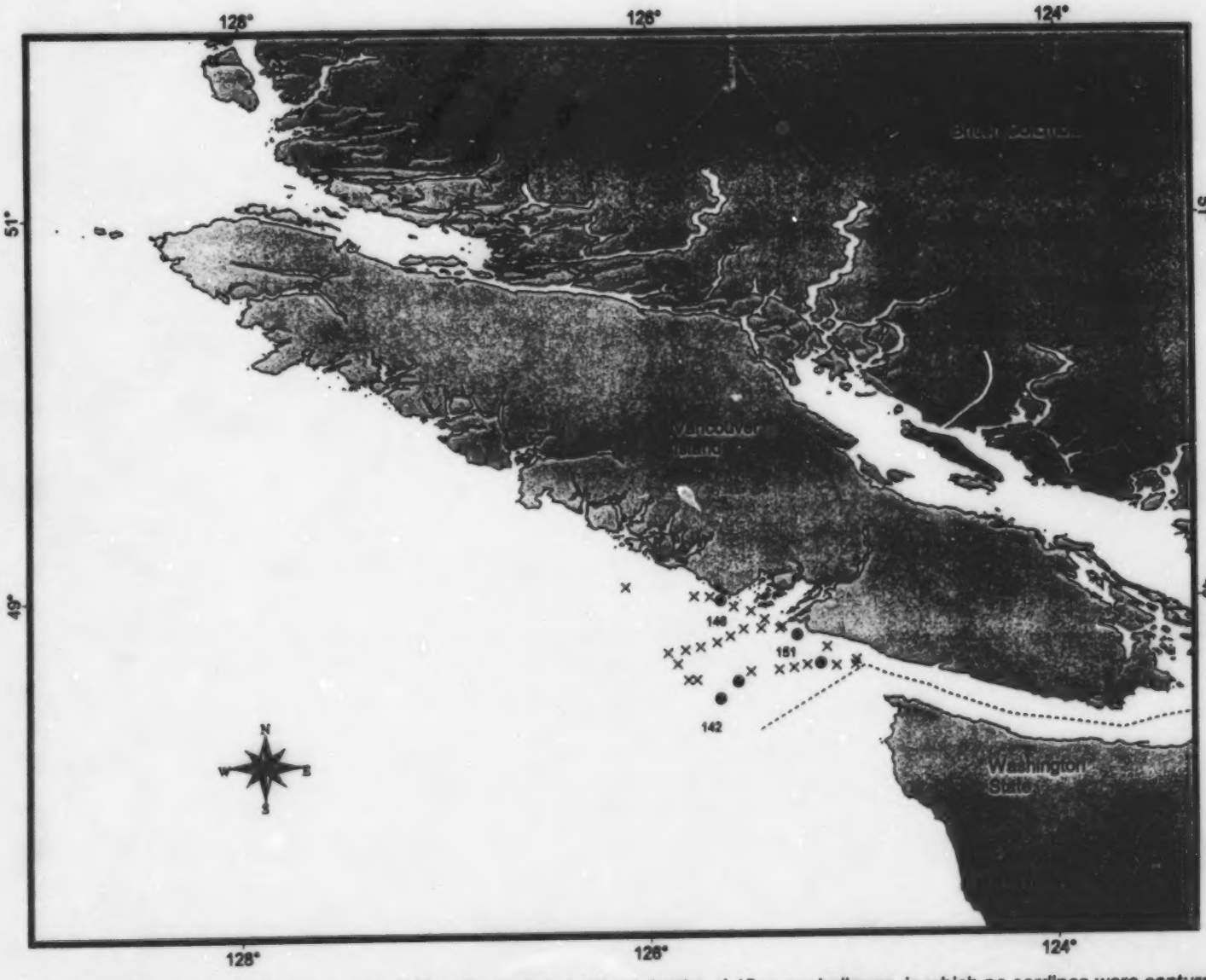
Appendix 22. Set data, Cruise 99-C, west coast of Vancouver Island, July 1 – 13, 1999. Data is presented for sets with sardine catch only.[a]

Set Number	115	116	121	125	130
Area	Gray's Harbour	Gray's Harbour	Gray's Harbour	Swiftsure	Swiftsure
Date	07/10/99	07/10/99	07/10/99	07/11/99	07/11/99
Depth (m)	surf	surf	-	surf	surf
Latitude	46.97	46.98	47.05	48.57	48.48
Longitude	-124.57	-124.65	-125.02	-125.06	-125.47
Effort (hr)	0.03	0.5	0.5	0.5	0.5
Net headrope temp (°C)	-	13.8	-	10.1	10.6
Sardine catch (kg)	0.32	5600	0.165	21450	3403
Sardine catch per hour (kg/hr)	9.6	11200	0.33	42900	6806
PACIFIC SARDINE (#)	2	31753	1	130000	20625
JACK MACKEREL (#)	2	270	-	111	13
PACIFIC MACKEREL (#)	-	157	-	21	20
CHINOOK SALMON (#)	-	1	-	48	3
COHO SALMON (#)	1	1	-	-	5
CHUM SALMON (#)	-	-	-	6	-
PINK SALMON (#)	-	-	-	3	1
PACIFIC HERRING (#)	1	-	-	-	-
BLACK ROCKFISH (#)	-	1	-	-	-
SOUPFIN SHARK (#)	-	1	-	-	-
SPINY DOGFISH (#)	-	-	-	96	25
DARKBLOTCHED ROCKFISH (#)	-	-	1	-	-
WOLFEEL (#)	-	-	-	-	-

Appendix 22 (cont'd)

Set Number	142	146	151
Area	La Perouse	Amphitrite	Cape Beale
Date	07/12/99	07/13/99	07/13/99
Depth (m)	surf	surf	15
Latitude	48.39	-	48.71
Longitude	-125.56	-	-125.17
Effort (hr)	0.5	0.5	0.4
Net headrope temp (°C)	11.1	9.6	10.1
Sardine catch (kg)	660	2451	5000
Sardine catch per hour (kg/hr)	1320	4902	12500
PACIFIC SARDINE (#)	4000	15000	28000
JACK MACKEREL (#)	84	-	5
PACIFIC MACKEREL (#)	70	-	-
CHINOOK SALMON (#)	-	-	20
COHO SALMON (#)	-	-	5
CHUM SALMON (#)	-	-	3
PINK SALMON (#)	-	-	-
PACIFIC HERRING (#)	-	-	1
BLACK ROCKFISH (#)	-	-	-
SOUPFIN SHARK (#)	-	-	-
SPINY DOGFISH (#)	1	-	-
DARKBLOTCHED ROCKFISH (#)	-	-	-
WOLFEEL (#)	-	-	1

[(a)]From July 1 – 13, 1999, a total of 41 sets were completed off the west coast of Vancouver Island, from 48.96°N, 126.04°W to 47.00°N, 124.40°W, using a midwater trawl. A total of 38 sets were made in surface waters (≤ 45m). Of the surface tows, sardines were captured in 8 sets (Appendix 22a). Species captured along with sardines included jack mackerel, Pacific mackerel, and spiny dogfish.



Appendix 22a. Cruise 99-C, July 1 - 13, 1999. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 22b. Length frequency data, Cruise 99-C, July 1 - 13, 1999.

	116			125			130			142			146			TOTAL		
Set#	M	F	U	M	F	U	M	F	U	M	F	U	M	F	U	MALE	FEMALE	UNK
Length (cm)																		
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	3	-	-	-	-	-	-	-	-	-	1	-	-	1		3
20	1	-	4	-	-	-	-	-	-	-	-	-	0	-	-	1		4
21	5	3	26	-	1	1	-	-	-	-	-	-	0	-	1	5	4	28
22	10	16	111	1	0	5	1	1	1	-	-	2	1	-	5	13	17	124
23	12	12	58	6	7	25	7	7	12	-	-	25	14	6	25	39	32	145
24	13	9	41	13	13	50	3	16	47	-	-	49	10	12	51	39	50	238
25	2	4	4	6	14	29	3	8	31	-	-	18	6	12	18	17	38	100
26	0	1	3	2	7	10	-	3	7	-	-	3	1	5	1	3	16	24
27	1	0	-	-	-	-	-	-	0	-	-	1	-	2	-	1	2	1
28	-	0	-	-	-	-	-	-	1	-	-	1	-	-	-		0	2
29	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-		1	1
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																119	160	670

Appendix 22c. Maturity - frequency data, Cruise 99-C, July 1 - 13, 1999.

Set	116	125	130	146	Total
Maturity					
Mature	44	42	43	47	176
Immature	-	-	-	1	1
Ripe	4	8	7	2	21
Total					198

Appendix 22d. Stomach contents data, Cruise 99-C, July 1 - 16, 1999.

Set	# of stomachs	Total Volume (cc)	Digested Material (cc)	Oikopleura (cc)	Euphausiid Eggs (cc)	Euphausiids (cc)	Unknown Eggs (cc)	Phyto-plankton (cc)	Filamentous Algae (cc)	Cyclopoid (cc)
105	50	12.1	2.14	5.11	0.45	0.0501	0.5208	0.7412	0.01	0.0003

Set	# of stomachs	Total Volume (cc)	Crab Zoea (cc)	Calanoids (cc)	Amphipods (cc)	Barnacle Cypris (cc)	Barnacle Naupili (cc)	Cladocera (cc)
105	50	12.1	0.12	2.8702	0.06	0.01	0.01	0.03

Appendix 23. Set data, Cruise 99-D, west coast Vancouver Island, August 4 – 8, 1999. Data is presented for sets with sardine catch only.[a]

Set Number	1	8	14	15	19
Area	Nootka	Quatsino	Quatsino	Quatsino	Kyuquot
Date	08/04/99	08/05/99	08/05/99	08/05/99	08/06/99
Depth (m)	surf	surf	surf	surf	surf
Latitude	49.53	50.43	50.41	50.42	49.87
Longitude	-126.68	-128.13	-128.63	-128.73	-127.24
Effort (hr)	0.5	0.5	0.5	0.5	0.5
Net headrope temp (°C)	12.8	12.7	14.4	12.7	-
Sardine catch (kg)	561	1630	500	22.27	363
Sardine catch per hour (kg/hr)	1122	3260	1000	44.54	726
PACIFIC SARDINE (#)	3421	9879	3049	135 caught from prev. set	2200
COHO SALMON (#)	9	17	-	-	-
CHINOOK SALMON (#)	25	-	-	-	-
CHUM SALMON (#)	2	255	15	-	-
PINK SALMON (#)	-	-	-	-	-
SOCKEYE SALMON (#)	5	-	-	-	-
BLUE SHARK (#)	-	-	4	-	-
PACIFIC HERRING (kg)	-	-	-	-	-
SPINY DOGFISH (kg)	1426	-	-	-	-
SABLEFISH (kg)	-	-	1	-	-
JACK MACKEREL (kg)	-	-	211.3	-	3.3
WALLEYE POLLOCK (kg)	-	-	-	-	-
LINGCOD (kg)	-	-	-	-	-

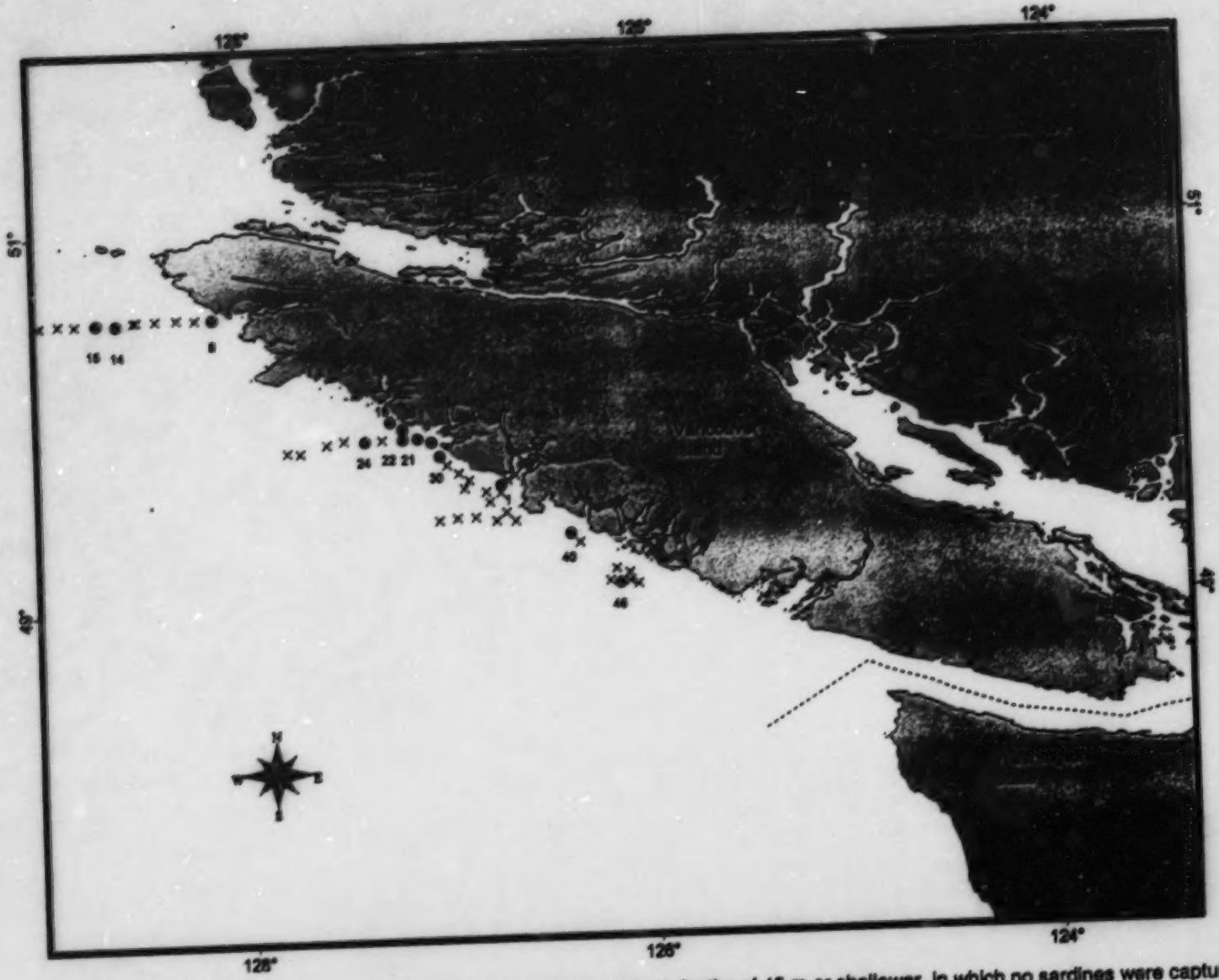
Appendix 23 (cont'd)

Set Number	20	21	22	24	29
Area	Kyuquot	Kyuquot	Esperanza	Esperanza	Esperanza
Date	08/06/99	08/06/99	08/06/99	08/06/99	08/07/99
Depth (m)	15	surf	15	30	surf
Latitude	49.83	49.78	49.78	49.77	49.76
Longitude	-127.17	-127.10	-127.17	-127.37	-127.03
Effort (hr)	0.5	0.5	0.5	0.5	0.5
Net headrope temp (°C)	-	11.6	10.1	10.1	13
Sardine catch (kg)	10	12	0.825	0.165	461
Sardine catch per hour (kg/hr)	20	24	1.65	0.33	922
PACIFIC SARDINE (#)	51 caught from prev. set	67	5	1	2811
COHO SALMON (#)	-	6	-	-	4
CHINOOK SALMON (#)	-	-	-	-	-
CHUM SALMON (#)	-	-	-	-	3
PINK SALMON (#)	-	-	-	-	1
SOCKEYE SALMON (#)	-	-	-	-	1
BLUE SHARK (#)	-	-	-	-	-
PACIFIC HERRING (kg)	-	trace	-	-	-
SPINY DOGFISH (kg)	-	-	-	-	1.4
SABLEFISH (kg)	-	-	-	-	-
JACK MACKEREL (kg)	-	-	-	-	6.1
WALLEYE POLLOCK (kg)	-	trace	-	-	-
LINGCOD (kg)	-	-	-	-	-

Appendix 23 (cont'd)

Set Number	30	40	46
Area	Esperanza	Clayoquot	Amphitrite
Date	08/07/99	08/08/99	08/08/99
Depth (m)	15	surf	surf
Latitude	49.68	49.26	49.00
Longitude	-126.99	-126.33	-126.08
Effort (hr)	0.5	0.5	0.5
Net headrope temp (°C)	10.7	12.2	10.6
Sardine catch (kg)	3.14	212.7	108
Sardine catch per hour (kg/hr)	6.28	425.4	216
PACIFIC SARDINE (#)	19 caught from prev. set	1289	659
COHO SALMON (#)	-	11	42
CHINOOK SALMON (#)	-	4	-
CHUM SALMON (#)	-	4	10
PINK SALMON (#)	-	1	-
SOCKEYE SALMON (#)	-	11	-
BLUE SHARK (#)	-	-	-
PACIFIC HERRING (kg)	-	trace	-
SPINY DOGFISH (kg)	-	5.3	trace
SABLEFISH (kg)	-	-	-
JACK MACKEREL (kg)	-	-	trace
WALLEYE POLLOCK (kg)	-	-	-
LINGCOD (kg)	-	3.7	-

[a]From August 4 – 8, 1999, a total of 47 sets were completed off the west coast of Vancouver Island, from 50.41°N, 129.02°W to 49.00°N, 126.00°W, using a midwater trawl. A total of 43 sets were made in surface waters (≤ 45m). Of the surface tows, sardines were captured in 13 sets (Appendix 23a). Species captured along with sardines included coho and chum salmon, jack mackerel and spiny dogfish.



Appendix 23a. Cruise 99-D, August 4 - 8, 1999. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 23b. Length frequency data, Cruise 99-D, August 4 - 8, 1999.

	1		8		14		19		21		29		40		46		TOTAL	
Set#	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	MALE	FEMALE
Length (cm)																		
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	2	2
16	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0
17	-	-	-	-	-	-	-	-	0	0	-	-	2	-	-	-	2	0
18	-	-	-	-	-	-	1	-	1	0	-	1	17	8	1	-	20	9
19	-	-	1	-	-	-	0	1	10	9	-	3	50	46	1	3	62	62
20	-	-	0	-	-	-	1	1	3	6	1	1	11	25	1	1	17	34
21	-	-	0	-	-	-	0	0	0	0	1	0	0	1	0	0	1	1
22	1	-	0	-	-	-	2	2	0	0	1	0	0	0	5	0	9	2
23	21	20	3	5	3	-	7	14	4	2	13	11	2	0	18	18	71	70
24	19	41	16	29	22	17	24	39	8	3	16	17	1	4	37	39	143	189
25	15	35	33	45	43	50	21	23	2	10	15	23	2	2	13	24	144	212
26	5	10	2	12	13	23	2	10	1	2	3	11	2	0	3	5	31	73
27	1	1	-	3	1	2	-	1	1	1	1	2	2	1	1	-	7	11
28	-	1	-	1	-	3	-	1	-	-	-	-	-	-	-	-	-	6
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																	509	671

Appendix 23c. Maturity - frequency data, Cruise 99-D, August 4 - 8, 1999.

Set	1	8	14	19	40	46	Total
Maturity							
Mature	50	49	50	50	50	50	299
Immature	-	-	-	-	-	-	0
Ripe	-	1	-	-	-	-	1
Total							300

Appendix 24. Set data, Cruise 99-E, La Perouse, August 11 – 14, Data is presented for sets with sardine catch only.[a]

Set Number	1	2	13	16
Area	40 mile bank	40 mile bank	SA3, sw corner	SA2
Date	08/11/99	08/11/99	08/13/99	08/14/99
Depth (m)	60	87	surf	surf
Latitude	48.59	48.54	48.75	48.94
Longitude	-125.63	-125.62	-125.89	-125.62
Effort (hr)	0.5	0.5	0.6	0.88
net headrope temp (°C)	-	-	10	12.6
sardine catch (kg)	0.17	109.1	133.8	351
Sardine catch (kg/hr)	0.33	218.2	223	397.36
PACIFIC SARDINE (kg)	1	661	811	2127
COHO SALMON (kg)	-	-	15	0.38
CHINOOK SALMON (kg)	49.1	29.5	11.7	8.95
CHUM SALMON (kg)	-	-	-	trace
PINK SALMON (kg)	-	-	1.24	-
SOCKEYE SALMON (kg)	-	-	2	-
PACIFIC HERRING (kg)	254.5	635.5	-	-
PACIFIC HAKE (kg)	1.2	4.4	-	-
SMELT (kg)	trace	-	-	-
JACK MACKEREL (kg)	23.74	-	24.1	-
SPINY DOGFISH (kg)	-	3.9	1370.9	-
YELLOWTAIL ROCKFISH (kg)	-	0.9	-	-

[A]From August 11 – 14, 1999, a total of 18 sets were completed in the La Perouse area, from 48.94°N, 126.62°W to 48.47°N, 125.45°W, using a midwater trawl. Two sets were made in surface waters (≤ 45m). Sardines were captured in both surface sets, as well as two deeper sets (set 1, 60m; set 2, 87m) (Appendix 24a). Species captured along with sardines in the shallow sets included coho and chinook salmon, jack mackerel and spiny dogfish. Species captured along with sardines in the deeper sets included chinook salmon, Pacific herring, and jack mackerel.

Appendix 24a. Cruise 99-E, August 11 - 14, 1999. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 24b. Length frequency data, Cruise 99-E, August 11 - 14, 1999.

	2		13		16		TOTAL	
Set#	M	F	M	F	M	F	MALE	FEMALE
Length (cm)								
5	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-
19	-	-	-	1	-	-	-	1
20	-	-	-	0	-	-	-	0
21	-	-	-	0	-	-	-	0
22	1	-	2	2	6	6	9	8
23	16	12	19	13	30	20	65	45
24	13	16	12	16	27	23	52	55
25	11	18	12	13	9	20	32	51
26	1	6	-	7	2	4	3	17
27	0	3	-	2	1	0	1	5
28	1	0	-	1	-	1	1	2
29	-	1	-	-	-	1	0	2
30	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-
Total							163	186

Appendix 24c. Maturity - frequency data, Cruise 99-E, August 11 - 14, 1999.

	16	
Set	M	F
Maturity		
2	5	3
3	17	7
4	2	0
12	5	11
Total	29	21

Appendix 25. Set data, Cruise 99-F, west coast of Vancouver Island, August 17 – 30, 1999. Data is presented for sets with sardine catch only.[a]

Set Number	1	4	5	8	11
Area	La Perouse	La Perouse	La Perouse	La Perouse	Amphitrite
Date	08/17/99	08/17/99	08/17/99	08/17/99	08/19/99
Depth (m)	0	0	0	0	0
Latitude	48.92	48.92	48.92	48.93	48.69
Longitude	-125.61	-125.81	-125.99	-126.44	-126.21
Effort (hr)	0.38	0.5	0.52	0.37	0.66
net headrope temp (°C)	-	-	-	-	-
sardine catch (kg)	1.5	0.15	58.9	491.4	0.4
Sardine catch (kg/hr)	3.95	0.3	113.27	1328.11	0.61
PACIFIC SARDINE (kg)	1.5	0.15	58.9	491.4	0.4
COHO SALMON (kg)	-	trace	-	-	-
CHINOOK SALMON (kg)	-	trace	trace	-	-
CHUM SALMON (kg)	-	-	-	-	-
PINK SALMON (kg)	-	-	-	-	-
SOCKEYE SALMON (kg)	-	-	trace	-	-
UNID'D SALMON (kg)	5.8	0.57	2.06	-	trace
PACIFIC HAKE (kg)	-	-	-	-	-
DUSKY ROCKFISH (kg)	-	trace	-	-	-
JACK MACKEREL (kg)	-	-	18.62	19.9	22.3
PACIFIC MACKEREL (kg)	-	-	-	35	1.75
YELLOWTAIL ROCKFISH (kg)	-	-	-	-	-

Appendix 25 (cont'd)

Set Number	12	13	14	15	16
Area	Amphitrite	Amphitrite	Amphitrite	Amphitrite	Amphitrite
Date	08/19/99	08/19/99	08/19/99	08/19/99	08/19/99
Depth (m)	0	0	30	0	0
Latitude	48.70	48.70	48.72	48.72	48.73
Longitude	-126.13	-126.05	-125.96	-125.96	-125.83
Effort (hr)	0.62	0.63	0.66	0.38	0.4
net headrope temp (oC)		-	-	-	-
sardine catch (kg)	0.9	0.4	0.165	0.2	3113.1
Sardine catch (kg/hr)	1.45	0.63	0.25	0.53	7782.75
PACIFIC SARDINE (kg)	0.9	0.4	0.165	0.2	3113.1
COHO SALMON (kg)	-	22.15	-	1.98	8.52
CHINOOK SALMON (kg)	1.63	20.3	-	6.7	-
CHUM SALMON (kg)	-	-	-	-	-
PINK SALMON (kg)	-	2.3	-	-	-
SOCKEYE SALMON (kg)	-	-	3.8	-	-
UNID'D SALMON (kg)	-	8.95	-	-	trace
PACIFIC HAKE (kg)	-	-	-	-	-
DUSKY ROCKFISH (kg)	-	-	-	-	-
JACK MACKEREL (kg)	13.4	97.5	-	12.5	33.4
PACIFIC MACKEREL (kg)	-	-	-	2.8	1.15
YELLOWTAIL ROCKFISH (kg)	3.8	-	-	-	-

Appendix 25 (cont'd)

Set Number	17	23	26	27	28	29
Area	Amphitrite	Swiftsure	Swiftsure	Swiftsure	Swiftsure	Swiftsure
Date	08/19/99	08/20/99	08/20/99	08/20/99	08/20/99	08/20/99
Depth (m)	15	0	0	15	0	0
Latitude	48.75	48.53	48.47	48.44	48.44	48.42
Longitude	-125.69	-125.08	-125.36	-125.44	-125.47	-125.59
Effort (hr)	0.48	0.38	0.7	0.66	0.35	0.66
net headrope temp (oC)	-	-	-	-	-	-
sardine catch (kg)	2.6	1.25	228.5	10.9	2435	3
Sardine catch (kg/hr)	5.42	3.29	326.43	16.52	6957.14	4.55
PACIFIC SARDINE (kg)	2.6	1.25	228.5	10.9	2435	3
COHO SALMON (kg)	-	-	-	-	trace	trace
CHINOOK SALMON (kg)	-	-	-	-	trace	-
CHUM SALMON (kg)	-	-	-	-	-	-
PINK SALMON (kg)	-	-	-	-	-	-
SOCKEYE SALMON (kg)	-	-	-	-	-	-
UNID'D SALMON (kg)	trace	trace	7.2	-	-	-
PACIFIC HAKE (kg)	-	-	0.3	-	-	trace
DUSKY ROCKFISH (kg)	-	-	-	-	-	-
JACK MACKEREL (kg)	-	23.7	508.7	70.1	15.9	-
PACIFIC MACKEREL (kg)	-	4.53	20.3	2.7	7.7	trace
YELLOWTAIL ROCKFISH (kg)	-	-	-	-	-	-

[a]From August 17 – 30, 1999, a total of 37 sets were completed off the west coast of Vancouver Island, from 48.92°N, 126.62°W to 47.76°N, 127.10°W, using a midwater trawl. A total of 32 sets were made in surface waters (≤ 45m). Of the surface tows, sardines were captured in 16 sets (Appendix 25a). Species captured with sardines included coho salmon, jack mackerel and Pacific mackerel.

Appendix 25a. Cruise 99-F, August 17 - 30, 1999. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 25b. Length frequency data, Cruise 99-F, August 17 - 30, 1999.

Set#	5		8		16		26		27		28		29		11		Total		
Length (cm)	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	MALE	FEMALE	UNK
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
19	11	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	7	27
20	8	3	-	-	-	-	-	-	-	-	-	-	-	-	1	11	18	113	
21	-	1	-	-	1	-	-	-	1	-	-	-	-	-	-	0	8	3	42
22	-	-	4	4	4	1	3	2	2	2	3	2	2	1	-	0	18	12	45
23	-	-	5	4	5	8	9	8	13	12	15	12	2	2	1	2	50	48	167
24	-	-	6	10	13	7	13	9	12	7	7	4	3	6	2	2	56	45	197
25	-	-	7	7	5	4	2	4	3	6	3	2	1	3	2	4	23	30	92
26	-	-	1	1	-	2	-	-	0	3	-	1	-	-	2	1	3	8	20
27	-	-	0	-	-	-	-	-	1	-	-	1	-	-	-	1	1	2	1
28	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																	176	174	711

Appendix 25c. Maturity - frequency data, Cruise 99-F, August 17 - 30, 1999.

Set	5	8	11	12	13	16	23	27	29	Total
Maturity										
Mature	51	50	3	5	3	50	7	69	20	258

Appendix 26. Set data, Cruise 00-A, La Perouse, July 25 – 30, 2000. Data is presented for sets with sardine catch only.[a]

Set Number	11	15
Area	La Perouse	La Perouse
Date	07/27/96	07/28/96
Depth (m)	52	-
Latitude	48.54	48.65
Longitude	-124.32	-125.87
Effort (hr)	-	-
Net headrope temp (oC)	-	-
Sardine catch (kg)	2	316
Sardine catch per hour (kg/hr)	-	-
COHO SALMON (kg)	15	1
CHINOOK SALMON (kg)	5	1
PACIFIC HERRING (kg)	1652	-
JACK MACKEREL (kg)	15	35
SPINY DOGFISH (kg)	1	1
AMERICAN SHAD (kg)	1	-

[a]From July 25 – 30, a total of 22 sets were completed in the La Perouse area off Vancouver Island, from 48.98°N, 126.74°W to 48.53°N, 125.05°W, using a midwater rope trawl. A total of 9 sets were made in surface waters (≤ 45m), 2 of which contained sardines (Appendix 2ðа). Species captured along with sardines included Pacific herring, coho and chinook salmon, and spiny dogfish.

Appendix 26a. Cruise 00-A, July 25 - 30, 2000. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 27. Set data, Cruise 00-B, west coast of Vancouver Island, August 1 – 7, 2000. Data is presented for sets with sardine catch only.[a]

Set Number	8	9	11	13	23	24
Area	La Perouse	La Perouse	La Perouse	Cape Beale	Estevan	Estevan
Date	08/01/00	08/01/00	08/01/00	08/02/00	08/03/00	08/03/00
Depth (m)	0	0	0	0	0	0
Latitude	48.40	48.38	48.35	48.79	49.37	49.36
Longitude	-125.62	-125.70	-125.81	-125.43	-126.66	-126.74
Effort (hr)	0.5	0.5	0.5	0.5	0.5	0.5
Net headrope temp (oC)	-	-	-	-	-	-
Sardine catch (kg)	24.6	1.4	0.4	0.6	0.4	0.2
Sardine catch per hour (kg/hr)	49.2	2.8	0.8	1.2	0.8	0.4
PACIFIC SARDINE (#)	123	7	2	3	2	1
COHO SALMON (#)	18	20	1	74	35	28
CHINOOK SALMON (#)	-	-	-	-	-	-
CHUM SALMON (#)	-	6	-	2		-
PINK SALMON (#)	-	27	-	1	4	16
SOCKEYE SALMON (#)	5		-	9	4	2
JACK MACKEREL (#)	-	-	-	-	-	-
PACIFIC HAKE (#)	-	-	-	-	-	-
SPINY DOGFISH (#)	1	-	1	-	-	3
PACIFIC HERRING (#)	1	-	-	-	-	-
WOLF EEL (juvenile) (#)	-	-	-	-	-	-

Appendix 27 (cont'd)

Set Number	33	34	35	36	54	55
Area	Nootka	Nootka	Nootka	Nootka (Bajo)	Esperanza	Esperanza
Date	08/04/00	08/04/00	08/04/00	08/04/00	08/06/00	08/06/00
Depth (m)	0	0	0	0	0	0
Latitude	49.58	49.37	49.51	49.55	49.77	49.77
Longitude	-126.60	-126.78	-126.75	-126.83	-127.23	-127.32
Effort (hr)	0.5	0.5	0.5	0.5	0.5	0.5
Net headrope temp (oC)	-	-	-	-	-	-
Sardine catch (kg)	1.4	0.2	6.8	0.4	1.8	0.2
Sardine catch per hour (kg/hr)	2.8	0.4	13.6	0.8	3.6	0.4
PACIFIC SARDINE (#)	7	1	34	2	9	1
COHO SALMON (#)	14	24	21	14	20	16
CHINOOK SALMON (#)	49	3	2	1	-	-
CHUM SALMON (#)	-	-	-	-	-	-
PINK SALMON (#)	-	-	-	-	44	27
SOCKEYE SALMON (#)	-	-	-	-	3	1
JACK MACKEREL (#)	-	-	-	-	-	-
PACIFIC HAKE (#)	-	-	-	-	-	-
SPINY DOGFISH (#)	1	-	-	-	-	-
PACIFIC HERRING (#)	1	-	-	-	-	-
WOLF EEL (juvenile) (#)	1	1	-	-	-	-

Appendix 27 (cont'd)

Set Number	58	59	63	64	65	68
Area	Esperanza	Esperanza	Esperanza	Amphitrite	Amphitrite	Amphitrite
Date	08/06/00	08/06/00	08/06/00	08/07/00	08/07/00	08/07/00
Depth (m)	0	15	0	0	0	0
Latitude	49.75	49.74	49.73	48.92	48.93	48.92
Longitude	-127.58	-127.67	-127.94	-125.61	-125.69	-125.94
Effort (hr)	0.5	0.5	0.5	0.5	0.5	0.3
Net headrope temp (oC)	-	-	-	-	-	-
Sardine catch (kg)	1037.2		0.2	371.6		9168
Sardine catch per hour (kg/hr)	2074.4	0	0.4	743.2	0	30560
PACIFIC SARDINE (#)	5186	27 (last tow)	1	1753	42 (last tow)	45840
COHO SALMON (#)	1	-	-	1	9	2
CHINOOK SALMON (#)		-	-	31	9	2
CHUM SALMON (#)	-	-	-	-	-	-
PINK SALMON (#)	-	-	-	-	-	-
SOCKEYE SALMON (#)	-	-	-	3	11	-

[a]From August 1 – 7, 2000, a total of 71 sets were completed off the west coast of Vancouver Island, from 50.42°N, 128.54°W to 48.34°N, 125.81°W, using a midwater rope trawl. A total of 54 sets were made in surface waters (≤ 45m), 18 of which contained sardines (Appendix 27a). Species captured along with sardines included coho, chinook and sockeye salmon, and spiny dogfish.

Appendix 27a. Cruise 00-B, August 1 - 7, 2000. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 27b. Length frequency data, Cruise 00-B, August 1-7, 2000.

	8		9		11	13		24		33		34		35		54		58	63	64		68			Total		
Set#	M	F	M	F	F	M	F	M	F	M	F	M	F	M	F	M	F	U	U	M	F	U	M	F	U	MALE	FEMALE	UNK
Length (cm)																												
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	-	-	-	-	-	-	-	-	0	1	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	1	-	-	1	2	1	2	2	1
23	1	1	-	-	-	-	-	-	-	-	-	-	3	2	-	0	1	-	-	6	5	7	13	4	32	22	14	39
24	18	7	-	2	-	1	-	-	-	1	-	1	2	7	-	2	1	22	-	9	10	54	19	32	75	58	54	151
25	21	31	2	1	2	0	-	-	-	1	1	-	6	10	-	1	0	73	-	5	11	67	10	14	54	50	66	194
26	8	17	0	1	-	1	1	-	1	1	1	-	1	3	-	-	1	57	1	-	3	25	2	3	19	15	29	102
27	2	6	1	-	-	-	-	-	-	1	1	-	-	-	-	-	1	11	-	-	-	5	-	1	3	4	9	19
28	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	8	2
29	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																										152	184	508

Appendix 27c. Maturity - frequency data, Cruise 00-B. August 1 - 7, 2000.

Set#	8	54	35	64	68	Total
Maturity						
2	-	2	-	-	-	2
3	2	-	2	-	-	4
12	48	7	33	50	100	238
Total						244

Appendix 28. Set data, Cruise 00-C, west coast Vancouver Island, September 9 – 28, 2000. Data is presented for sets with sardine catch only.[a]

Set Number	165	169	170	179	180	181
Area	Amphitrite	Amphitrite	Amphitrite	Amphitrite	Amphitrite	Amphitrite
Date	09/27/00	09/27/00	09/27/00	09/28/00	09/28/00	09/28/00
Depth (m)	15	0	30	0	15	30
Latitude	48.62	48.61	48.60	48.94	48.93	48.93
Longitude	-125.74	-126.10	-126.20	-126.26	-126.34	-126.42
Effort (hr)	0.5	0.42	0.5	0.5	0.5	0.5
Net headrope temp (oC)	-	-	-	-	-	-
Sardine catch (kg)	0.165	48.32	3.135	842.16	11.72	0.5
Sardine catch per hour (kg/hr)	0.33	116.03	6.27	1684.32	23.43	1.0
PACIFIC SARDINE (#)	1	294	19	5104	71	3
COHO SALMON (#)	74	2	-	42	-	-
CHINOOK SALMON (#)	1	-	-	1	-	-
PINK SALMON (#)	-	1	-	-	-	-
SPINY DOGFISH (#)	-	-	-	2	-	-
SABLEFISH (#)	-	5	-	2	-	-
AMERICAN SHAD (#)	-	1	-	-	-	-
PACIFIC HERRING (#)	1	-	-	-	-	-
PACIFIC MACKEREL (#)	-	2	1	-	-	-
JUVENILE ROCKFISH (#)	-	-	1	-	-	-
JUVENILE GUNNEL (#)	-	-	-	-	-	1
WOLF EEL (#)	-	-	1	-	-	-

[a]From September 9 – 28, 2000, a total of 106 sets were completed off the west coast of Vancouver Island, from 51.43°N, 128.15°W to 48.32°N, 123.74°W, using a midwater rope trawl. A total of 90 sets were made in surface waters (≤ 45m), 6 of which contained sardines (Appendix 28a). Species captured along with sardines included coho and chinook salmon, Pacific mackerel, sablefish, and Spiny dogfish.

Appendix 28a. Cruise 00-C, September 9 - 28, 2000. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

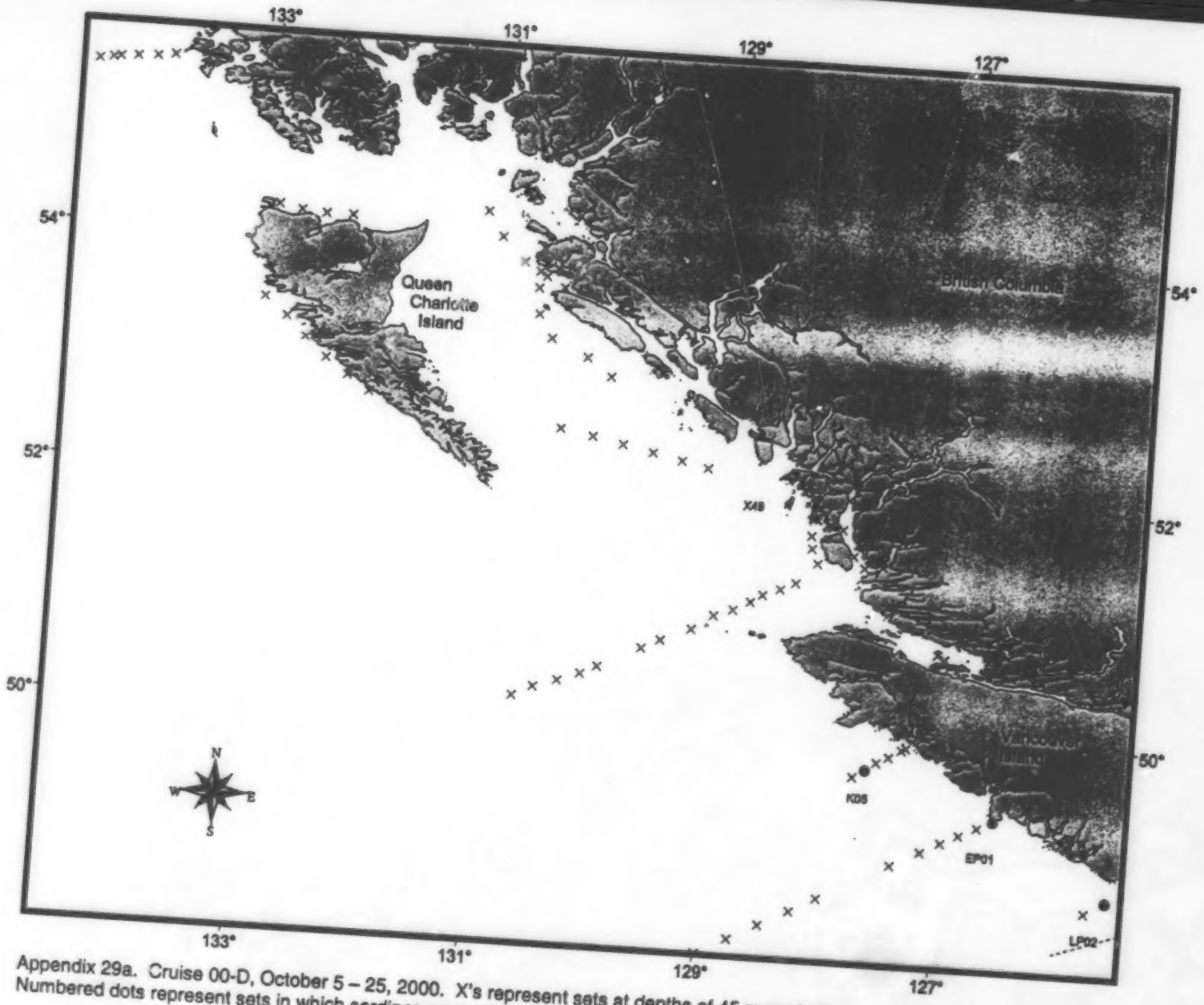
Appendix 28b. Length frequency data, Cruise 00-C, September 9 - 28, 2000.

	165			169			170			179			Total		
Set#	M	F	U	M	F	U	M	F	U	M	F	U	MALE	FEMALE	UNK
Length (cm)															
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1
22	-	-	-	-	-	3	-	-	1	0	-	1	0	-	5
23	-	-	-	-	1	18	-	-	5	5	1	16	5	2	39
24	-	-	1	9	3	30	-	-	7	5	6	31	14	9	69
25	-	-	-	2	4	29	-	-	4	6	7	50	8	11	83
26	-	-	-	1	6	16	-	-	1	5	2	20	6	8	37
27	-	-	-	1	2	3	-	-	1	1	1	1	2	3	5
28	-	-	-	-	1	1	-	-	-	-	-	-	-	1	1
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total													36	34	240

Appendix 29. Set data, Cruise 00-D, west coast of Vancouver Island, October 5 – 25, 2000. Data is presented for sets with sardine catch only.[a]

Set Number	LP02	EP01	K05	X49
Area	La Perouse	Estevan	Kyuquot	Hugh Fitz Strait
Date	10/04/00	10/05/00	10/07/00	10/29/00
Depth (m)	0	0	0	0-25
Latitude	48.71	49.35	49.71	52.15
Longitude	-125.55	-126.54	-127.66	-127.88
Effort (hr)	0.5	0.48	0.5	0.5
Net headrope temp (oC)	-	-	-125.55	9
Sardine catch (kg)	4910	446	1.14	486
Sardine catch per hour (kg/hr)	9820	922.76	2.28	972
PACIFIC SARDINE (#)	25872	2352	6	2560
PINK SALMON (#)	2	12	-	
COHO SALMON (#)	16	15	-	27
CHINOOK SALMON (#)		4	-	8

[a]From October 5 – 25, 2000, a total of 83 sets were completed off the west coast of Vancouver Island, from 55.42°N, 133.90°W to 48.08°N, 128.99°W, using a midwater rope trawl. A total of 83 sets were made in surface waters (≤ 45m), 4 of which contained sardines (Appendix 29a). Species captured along with sardines included pink, coho and chinook salmon.



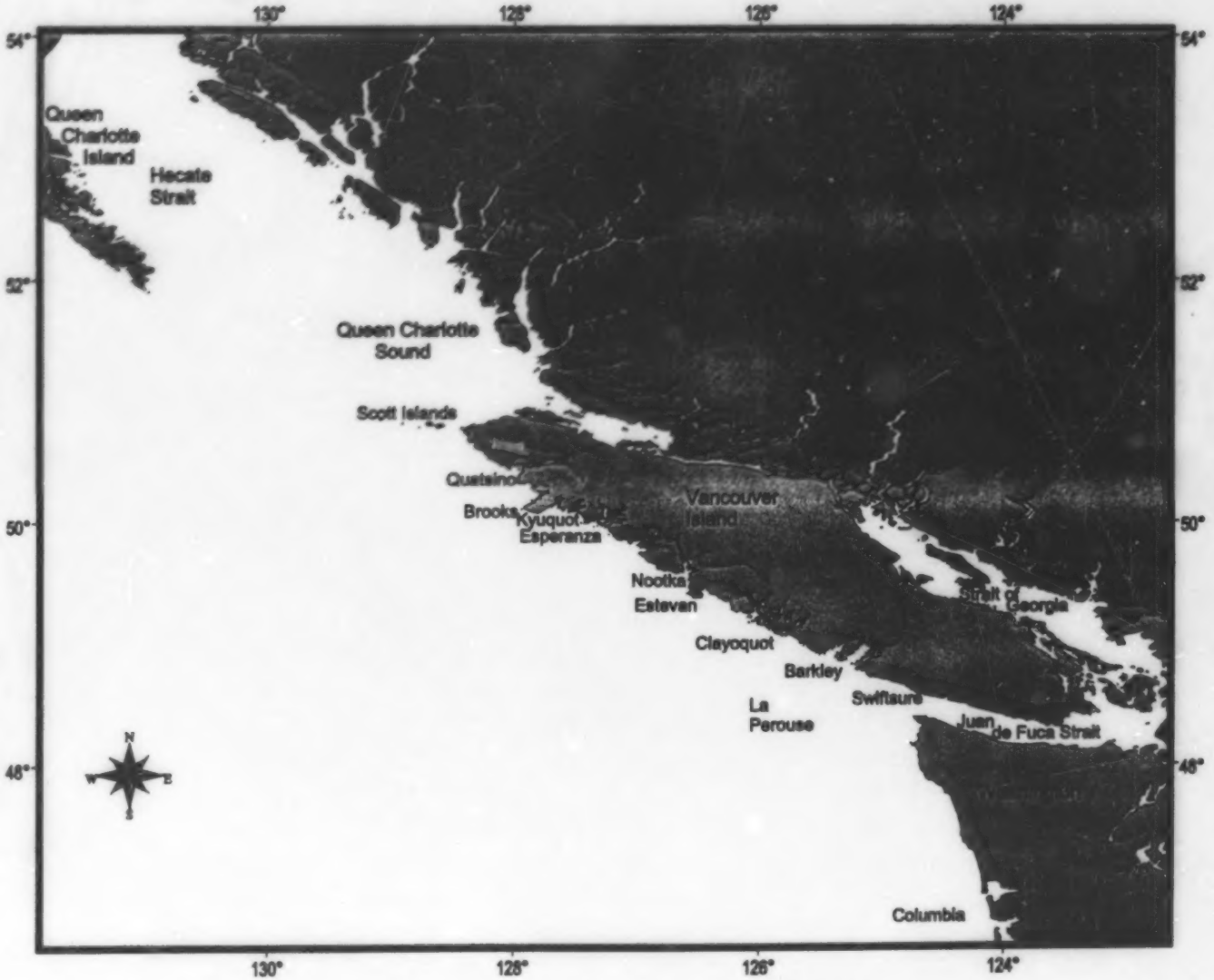
Appendix 29a. Cruise 00-D, October 5 – 25, 2000. X's represent sets at depths of 45 m or shallower, in which no sardines were captured. Numbered dots represent sets in which sardines were captured.

Appendix 29b. Length frequency data, Cruise 00-D, October 5-25, 2000.

Set#	EP01	LP02	K05	X49	Total
Length (cm)					
5	-	-	-	-	-
6	-	-	-	-	-
7	-	-	-	-	-
8	-	-	-	-	-
9	-	-	-	-	-
10	-	-	-	-	-
11	-	-	-	-	-
12	-	-	-	-	-
13	-	-	-	-	-
14	-	-	-	-	-
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	-	-	-	-	-
19	-	-	-	-	-
20	-	-	-	-	-
21	-	-	-	-	-
22	-	-	-	-	-
23	2	6	-	-	8
24	18	16	-	8	42
25	19	19	2	35	75
26	7	8	3	41	59
27	2	1	0	15	18
28	1	-	1	1	3
29	-	-	-	-	0
30	-	-	-	-	-
31	-	-	-	-	-
32	-	-	-	-	-
33	-	-	-	-	-
34	-	-	-	-	-
35	-	-	-	-	-
Total		6	100	205	

Appendix 30. Place names or abbreviations, and corresponding map areas for cruises, 1992 – 1999.

Placename or Abbreviation	Map location or definition
Amphitrite Pt.	Barkley
Barkley Sound	Barkley
Bonilla Pt.	Juan de Fuca Strait
Brooks Peninsula	Brooks
Cape Alava	Off Washington
Cape Beale	Barkley
Cape Lazo	Strait of Georgia
Cape Mudge	Strait of Georgia
Cape Ommaney	Alaska
Carmannah	Juan de Fuca Strait
Clayoquot	Clayoquot
Columbia	Columbia
Esperanza	Esperanza
Estevan	Estevan
Finger Bank	La Perouse
Gower Pt.	Strait of Georgia
Grey's Harbour	Columbia
Hecate Strait	Hecate Strait
Hornby	Strait of Georgia
JDF	Juan de Fuca Strait
Kyuquot	Kyuquot
La Perouse	La Perouse
NE Little River	Strait of Georgia
Neah Bay	Juan de Fuca Strait
Nootka	Nootka
North Arm	Strait of Georgia
Offshelf	Offshelf, off west coast Vancouver Island
Pillar Pt.	Juan de Fuca Strait
Pt. San Juan	Juan de Fuca Strait
QCS	Queen Charlotte Sound
Quatsino	Quatsino
SA2	La Perouse
SA3 SW corner	La Perouse
Sand Heads	Strait of Georgia
Seal Rocks	Juan de Fuca Strait
Shipwreck	Juan de Fuca Strait
Slip Pt.	Juan de Fuca Strait
Sombrio Pt.	Juan de Fuca Strait
Swiftsure	Swiftsure
Tatoosh Island	Juan de Fuca Strait
Thrasher Rock	Strait of Georgia
Triangle Island	Scott Islands
Washington	Off Washington
WCVI south	South west coast Vancouver Island
40 Mile Bank	La Perouse



Appendix 30a. Place names and locations surveyed during cruises from 1992 to 1999.